

THE
HANDMAID
TO
THE ARTS.

IN TWO VOLUMES,

TEACHING,

- I. A perfect knowledge of the MATERIA PICTORIA; or, the Nature, Use, Preparation, and Composition of all the various Substances employed in PAINTING, as well Vehicles, Dryers, &c. as Colours; including those peculiar to Enamel Painting on Glass.
- II. The Means of Delineation, or the several DEVICES employed for the more easily and accurately making DESIGNS FROM NATURE, or DEPICTED REPRESENTATIONS; either by Off-tracing, Calking, Reduction, or other Means; with the Methods of taking Casts and Impressions, from Figures, Busts, Medals, Leaves, &c.
- III. The various manners of GILDING, SILVERING, BRONZING, with the preparation of the genuine GOLD and SILVER Powders, and Imitations of them; as also of the Fat Oil, Gold Sizes, and other necessary Compositions;—the Art of JAPANNING, as applicable not only to the former Purposes, but to Coaches, Snuff-boxes, &c. in the Manner lately introduced; and the method of STAINING DIFFERENT KINDS OF SUBSTANCES, with all the several Colours.

The whole being calculated, as well for conveying a more accurate and extensive Knowledge of the Matters treated of to professed Artists, as to initiate those who are desirous to attempt these Arts, into the method of preparing and using all the Colours, and other Substances employed in Painting in Oil, Miniature, Crayons, Encaustic, Enamel, Varnish, Distemper, and Fresco; as also in Gilding, &c.

A NEW EDITION,

WITH CONSIDERABLE ADDITIONS AND IMPROVEMENTS.

VOL. I.

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TO THE
SOCIETY

FOR THE
ENCOURAGEMENT OF ARTS, MANUFACTURES,
AND COMMERCE.

GENTLEMEN,

THE correspondence betwixt the design of this Work, and the views of your Institution, naturally points out to me, to whom it may be address'd with the greatest propriety.

THE furnishing means of establishing and improving useful Arts, especially those which relate to considerable Manufactures, and the creating incitements and motives to the exercise of those means, are to a country that owes its riches, power, and even domestic security to commerce, of the greatest concern and moment; and it is more peculiarly meritorious in those, who, in a private capacity, exert their utmost endeavours on these accounts, as such pursuits seem to take up a very little share of the regard of the Public here, at a time, when all the neighbouring governments (especially that of our rival France)

DEDICATION.

make them a principal object of their attention and care. To You, therefore, I dedicate this Book, as it is not only in your power, but entirely within the sphere of your professed intentions, to enforce, in a more extensive and publicly beneficial way, the practice of many particulars taught in it.

I am, Gentlemen,

Your most obedient,
and humble Servant,

THE AUTHOR.



THE

P R E F A C E.

THAT the national improvement of skill and taste, in the execution of works of *design*, is a matter of great importance to any country, not only on account of the honour which is derived to civilized nations by excelling in the polite arts, but likewise of the commercial advantages resulting from it, will be allowed by all who have not very singular notions with respect to these matters; though in what degree such improvements are essentially interesting to us at present, is scarcely conceived by any but those who particularly concern themselves in speculations of this nature. The strong disposition that prevails not only in the European countries, but in the respective settlements of their people in Asia and America, for using those decorations and ornaments in drefs, as well as buildings, equipages, and furniture, that employ the arts of design, gives at present the foundation of several of the most considerable branches of trade; and this is daily increasing, with the luxury that seems removing from the East, and spreading itself over these Western countries and their colonies, in such manner as will probably soon render some articles of this kind equal in return to the most staple and extensive of those of the former commerce. As, moreover, several circumstances both of our æconomical and political condition, by enhancing to a very high degree the price of common necessaries, and introducing more expensive modes of life, are depriving us of the share we had of the grosser manufactures that depend on labour, it peculiarly behoves us at present to exert ourselves in cultivating those of a more refined nature, where skill and taste (in which we by no means seem naturally wanting)

are required to give a higher value to the work, and to stand in the place of a higher proportion of manual operation.

It must be with regret, therefore, we see the French have long got the start of us in this very material pursuit; and that the encouragement given by their government, together with the opportunities afforded by a well-instituted academy, has diffused such a judgment and taste in *design*, among all classes of artisans, as render France at this time the source of nearly all invention of fashions, and necessarily occasion an extreme great demand from her for all those articles, in the production of which such talents are exercised.

The advantages which France has now over us in these concerns, are not however so well secured, that we should despair of being able, in time, to wrest them out of her hands. For where the mechanical part, either as it depends on machines or manual dexterity, is in question, we have given on all occasions the proofs of superior abilities; and whenever, therefore, the improvement of fancy and propriety in the designing of models and patterns shall be so far advanced here, as to put us on a level with her in those points, we shall soon become as formidable a rival to her, in what she now considers her *peculium*, as she has in a parallel manner been before to us, in the woollen trade, from our advanced price of labour.

The measures by which this very desirable end may be attained, consist of three particulars; the founding a well-regulated academy, where not only youth and novices may have an opportunity of being well initiated in the principles of *design*; but where even artists themselves may have the means of inducement to further study, in order to the strongest exertion of their genius;—the creating such incitements, by pecuniary rewards or honorary distinctions, to excel in these arts, and more especially in the application of them to the perfecting those manufactures, to which they have any relation, as may stimulate the more indolent, and raise greater emulation among the forward, to apply their utmost powers to excel;—and the diffusing a more general and accurate knowledge of those secondary or auxiliary arts that are requisite to the practising *design*, or to the execution of works dependent on it. The first

must hope, will be some time thought an object worthy the notice and care of the government; since it is too apparent, from the failure of the attempts already made, that nothing effectual with regard to it can result from the efforts of private persons. The second might be procured by a right dispensation of the premiums of the society instituted for that purpose. The last are intended to be supplied by this work, but with what title to success, I must leave it to the judgment of the public to determine; only I will take the liberty of shewing somewhat more explicitly here, in what particular manner it is proposed to effect this end.

A disquisition on the MATERIA PICTORIA makes the first part; where the natural history, preparation, and use, of not only the substances of which colours are formed, but of all others rendered subservient in any way to the purposes of painting, are distinctly taught, with the manner of composition, and application of them, as they depend either on mechanical or chemical operations. The principal view in this disquisition is to enable those, who have already learned to draw, to make themselves easily masters of painting in any manner they may choose; by which assistance many persons of genius, who, from ignorance of the nature and use of colours, might be deterred from it, may be both induced and enabled to attempt painting successfully, and bring those talents into practice, which would be otherwise lost to the public and themselves. But it is not to those alone the view of benefit is confined. The present adulterate and imperfect preparation of the colours, from the sordidness and ignorance of the Jews, and other low people concerned in the preparation of them, is a disadvantage of the highest moment to such as paint, even with the greatest skill, either in oil or water, and for which they can find no apposite remedy without some aid of this kind; for, as the preparation of colours is kept a secret in the hands of those few who manufacture them, either here or abroad, and consequently is very little known to modern painters; and as a much greater share of knowledge in natural history, experimental philosophy; and chymistry, is required to the understanding the nature of the simples, and principles of the composition, in a speculative light, than is consistent with

the study of other subjects more immediately necessary to an artist, there remains no means of surmounting this difficulty, but the being supplied, by some person, whose application could be more properly directed to the attainment of this science, with such a system of the theory and practice of every thing relative to the *Matiria Pictoria*, as may enable them either to prepare the colours themselves, where not to be otherwise obtained perfect, or to judge critically with some certainty of the goodness of such as they procure from others. This I have therefore attempted on their behalf; and I hope not in vain, as not only a general acquaintance with the practice of the several branches of the chemical art, but a very large experimental inquiry into the nature of these subjects in particular, form my pretensions to some knowledge of them.

As the depravity of the manner of preparation has also extended itself to the very priming of cloths for grounds of painting, (a work trusted too neglectfully at present to the care of colourmen) from whence great inconvenience to the painter, and detriment to the pictures, are produced, I have subjoined a method, by which those, who are really in earnest about the merit of their performances, may procure cloths to be made without either Riffening, cracking, or causing (as it is called) *the colours to sink in*. And, as this has an apparent utility with respect to painters in the case of new pictures, so the improvements offered in the methods of cleaning, preserving, and mending the old, are not less obviously beneficial to others possessed of the works of former masters. The art of cleaning pictures being indeed of the utmost consequence to the interest of *taste*, as no lover of the polite arts can reflect, without the utmost regret, on the vast havoc made in the works of all the great painters by erroneous and faulty management in this point.

The explanation of the nature, and manner of application of the colours, grounds, &c. used in that method, called *painting in encaustic*, is here first introduced into the work, in this second edition of it. Whatever has been hitherto brought before the public under this name, must be considered rather as an essay towards a new manner of painting, than the completion of an art. When this work was first printed, Count Caylus was the sole person who had offered any thing of such a kind to the world; and

what he published of his trials, only seemed to prove the difficulty of bringing this method to any useful degree of perfection. Since that time, many other persons have made attempts in the same way; and Mr. Muntz has published a treatise on the subject, in which, he pretends, to have made such improvements on Count Caylas's method, as to have rendered this manner of painting of practical importance. The concurrence of others with him in this opinion, and the attention which the public have given to this matter, have rendered some notice of it, at present, proper in this work. I have therefore presented a full, though concise account of whatever material has been advanced on this head, with such observations, as well on the whole, as several particulars, has occurred to my own judgment.

A complete system of the theory and practice of enamel painting, forms the next article, the value of which will be best understood by those for whose use it is intended. For as this art is of late introduction among us, and the manner of conducting it, with respect to the preparation and composition of the colours, fluxes, and grounds, has been carefully concealed in the places abroad where it has been longer established, a very small share of knowledge in the preparation of the colours, and yet less of that of the grounds and fluxes, is the whole hitherto gained by the artists of this country. They are for the most part obliged to employ a white enamel prepared at Venice for their ground, to pick up the remains of a kind of glass formerly made there for a flux, and to procure the colours, either in a more perfect or faulty state as they can meet with them, except in the case of those who have recipes for some kinds which they prepare; but with that precariousness of the qualities, that attends the blindly following recipes, without any comprehension either of the general properties of the ingredients, or principles of the operations. From which circumstances, uncertainties in the success, and embarrassments in the work, are the frequent result, as well as from a want of understanding the nature of the substances they use, as the not being able to procure what is good of each kind, or fit for their particular purpose.

The assisting in the cultivation of the art of enamelling here was indeed one principal object of the design of this

book, as such art is very materially interesting to us at present; for it is become the basis of a manufacture, from which we may expect great advantages; since we already see it carried suddenly to such a degree of perfection, with respect to the facility of working, as to raise a demand for the produce in foreign markets; notwithstanding the long practice and cheap living of the people of Geneva, who had been in possession of this branch of commerce for a considerable time, gave them originally the greatest advantage in it over us.

This part of the work has been censured by some, who have consulted the former edition, as giving erroneous or insufficient instructions with respect to the preparation of several of the colours. But I am satisfied, that as to most of those objections, the error, or defect, lay rather in the manner of trial to put them in practice, of those who condemned them, than in the instructions themselves. It is not indeed to be wondered at, that persons who are wholly unaccustomed to chemical processes, should miscarry in the attempting some of these, which are of the nicest kind, and where the intention may be frustrated by so many minute accidents; and therefore not a just conclusion, to infer from experiments so made, that the end proposed may not be effected by the same means more accurately applied. The process for obtaining a crimson colour from gold, is an instance, which verifies this in the strongest degree. For though many have attempted this matter without the desired success, yet I have unquestionable evidence, that others have obtained the end, even beyond their most sanguine expectations, without the least aid, but what they have received from this work. The same holds good of most of the other articles of importance, respecting the art of enamelling, and I have therefore made very little change in this edition, except the adding some new articles, as to this part of the work.

The painting on glass with vitreous colours is not a matter of equal importance with enamelling; but, as it is considered as one of the arts of which the mystery is at present lost to us, (though, on the contrary, being in fact nothing more than painting with transparent enamel colours on glass grounds by much the same methods, the modern improvements made in the art of enamelling have given us an equal superiority in this) I thought it a ne-

cessary part of the work; and have accordingly entered on an explanation of the whole of it; availing myself, nevertheless, of its affinity with enamel painting, so as to refer for most particulars to what was before laid down on that score, and enlarge only on some points in which a difference is found betwixt them. But I flatter myself, that, notwithstanding the brevity of the manner, any person may, by a proper attention to what is delivered on this head, easily make himself master of every thing peculiar to painting on glass.

The gilding enamel and glass by vitreous colours, and annealing, was a necessary appendage to the art of painting in enamel; but there is yet another circumstance which made the communication of the best methods of doing this of some consequence to the public. It is the great demand now subsisting for drinking-glasses with gilt edges, which are mostly, at present, either imported from Germany, or fraudulently imitated here by gilding with gum water or sizes that will not bear moisture; though, were the means well understood, they might in large parcels, with very little more expence or trouble, be done in the genuine manner.

The method of taking off mezzotinto prints on glass, which makes the next article, is not a matter of any great moment; but, as the practising it is very alluring, by the production of pictures even without being able to draw, it may be an inducement to some to apply themselves to painting and the study of *design*; since those will not long rest satisfied with this manner of exercising their fancy, who have a genius for greater things.

The art of washing maps and other prints is however of more general use, and requires no apology for holding a place in the work.

The devices and mechanical means employed for the more easily and accurately obtaining out-line sketches of designs after nature or works of art, which begin the second part, are of the greatest assistance and service to all who paint or draw; and though most of them are known to artists of larger experience, yet beginners are to learn them, and most frequently want an adequate opportunity. On their account, therefore, they were necessary for the answering the full intention of this book; and perhaps even such as are more versed in these matters, may meet

with something not unacceptable to them in a collection of inventions of this nature, so copious as that given.

The methods of casting in large, which follows in this part, will be much less extensively useful, as it is practised only by few; and the managing it in more difficult cases not easily reducible to rule. But some notice of them were wanting to render the system complete; especially as they are connected so as not to bear well a separation from them with those of casting medals and other smaller pieces, and the manner of taking off impressions from various subjects; both which are articles of very general utility.

The displaying the several methods of gilding, which is done in the third part, will be found a convenience to numbers, who would occasionally practise them, if they had the means in their power; and the application of the art of japanning to so many purposes, where a mixture of gilding is required, as the introduction of *papier mache* has occasioned lately, makes this communication particularly seasonable at present.

The article of gilding leather, as practised for the manufacture of hangings, screens, &c is of very great importance. It is indeed only practised by some few, who carry on great concerns in it; but I thought an explanation of the art merited a place here, as it may furnish the means of such trials to others, as may lead to improvements. There is more reason to hope this, as the method here described is that practised in France at present, and differs in some particulars from the English. The principal object is the composition of the laquer or varnish, which is every where concealed as a secret by the manufacturers. But the recipe here imparted will produce such, as is at least equal to the best hitherto in use.

Silvering and bronzing have also their utility, though in a less degree than gilding; and therefore properly claim to follow it, as they are in fact only different applications of the same means.

The knowledge of the methods of japanning is at present more wanted than that of any other of the mysterious arts whatever, as it is now demanded to be practised on coaches and other vehicles in a very large and expensive way, by those who till lately were utter strangers to it. Information of this kind, such as is intended to be con-

veyed in the fourth chapter of this part, is in a peculiar manner requisite to them, that they may the more easily and readily execute those designs they have shewn themselves capable of making, (when sufficiently paid to afford the due application) with a taste and judgment that proves them to be not greatly inferior to the French in this species of performance, though so lately undertaken by them.

Laquering had too great an affinity with japanning not to be joined with it in this work, though it is of less consequence. Having, however, been carried by some to much greater perfection here than in any other country, even to the rivalling gilding in its effect, the communicating the best composition of laquer to numbers, who are either compelled to purchase what they use of particular persons that have the secret of preparing it; or to employ a very inferior kind of their own production, is not without such advantages as may make it to be properly considered as one means of improvement in the more elegant manufactures.

The means of staining paper, parchment, wood, ivory, bone, horn, and stones of any kind, with all the variety of colours, make the last contents of this work, and will, I hope, for purposes of real use as well as amusement, be found agreeable to many. Their greatest relation to the arts of design lies, however, in the article of staining stones, from the frequent occasion statuary, and others who work in marble and alabaster, have to give artificial colours to them; the method of doing which, in a more perfect manner, is nevertheless known to very few at present.

These are the particular topics of instruction contained in the first volume, by which this work is intended to promote the improvement of the arts, and the more curious kinds of manufactures; and excepting engraving, etching, and scraping mezzotintos, they comprehend most subjects that have any immediate relation to them; though some are touched upon in a more copious, and others only in a brief manner, according to the importance of the matter, or the room given for an advantageous enlargement on it.

It may probably be imagined, that the ends proposed by this treatise may be answered by the writings of others already published, as there is more than one book in our

own language, which pretend to plans not greatly different from that on which it is formed, besides a multiplicity of others that profess to teach particular arts. But on a closer examination, I am afraid it will by no means be found that all the volumes which have been compiled on these heads taken together, and much less any single one of the number, have effectually provided the information wanted, or even gone any considerable lengths towards it. One could scarcely believe, nevertheless, without having perused them, that almost every book already written on these subjects so generally interesting, should be egregiously defective in matter, form, and veracity; and yet this is almost equally the case of all where they are treated of in a more copious and extensive manner. But it will appear less extraordinary when we find, that the authors were for the most part unacquainted, in an experimental way, with what they took upon them to teach, and not better qualified with any speculative knowledge that could enable them to judge critically of what they procured on the authority of others. They therefore either blindly copied after former writers, or added implicitly such additional articles, as the reports of living persons they inquired of furnished them with, and were perhaps as often deceived by the design as the ignorance of those from whom they sought information, being themselves possibly not always very solicitous so much about the value, as the quantity of what they collected.

With respect to the preparation of painters' colours, *Neri*, in his treatise on glass, seems to have laid the foundation for all the collections of recipes of that kind published here, probably from its becoming known by means of *Merret's* translation to the writers, whose reading was not extensive enough to lead them to an acquaintance with *Birellus*, or the passages in *Mathiolus*, *Warmius*, *Cesalpinus*, and others who have occasionally touched on this head.

Caneparius, in his book *de Atramentis*, gave a more extensive view of the preparation and composition of the pigments for painting, by adopting what *Neri* had given, (though he has never quoted him by name) and adding several more particulars omitted by him, as likewise a variety of other practices relating to the arts, but mixed

with many erroneous and false accounts both of the processes and produce of them.

Merret, an English physician, translated Neri into our language, and gave notes upon him; but not having, as appears, the least light to direct him in his opinions, but what he borrowed from other writers, his observations neither illustrated nor augmented, in any material degree, the contents of Neri's book.

Kunckel republished, in the German language, Neri's work with Merret's notes, and his own observations on both; and he also inserted, as well there as in his other dissertations on the art of making glass, several processes for the preparation of painters' colours, much better than those of Neri or the others before him; as likewise many more useful recipes regarding the arts and mysterious trades. But he seems to be the only writer, who has treated these subjects in a more diffusive manner, that was experimentally conversant with what he undertook to teach.

After this *Salmon*, in his *Polygraphices*, took upon him to give instructions for the practice of almost all the arts and mysterious trades; and by the assistance of the former writers, and private information, got together a larger body of matter respecting these subjects than any before him had done. His collection would indeed have had considerable merit at the time it was published, if the valuable parts had not been confounded with such a heap of absurd stuff and falsties, as rendered every passage suspicious, and disposed in a manner so void of all order and method, that (an index being wanting likewise) it was impracticable, without turning over and carefully examining a great number of pages, to find any article required; though several are repeated four or five times over in different places. But the difficulty of finding what was wanted, and uncertainty whether what might be found would prove a just account of the matter, or some extravagant blunder or imposition, discouraged those who might have profited by many of his recipes and instructions, from seeking any assistance from him in matters of a more nice or common nature. This conduct in digesting with so little care, and debasing with impertinences and falsehoods, the proper matter of that work, is however no great ground of wonder in the case of a writer, who, after

he found this book met with a good reception from the public, was capable of conspiring with booksellers to blend a long discourse of chiromantical signatures, or the means of telling fortunes by the lines of the hands, and a mass of the most ridiculous nonsense that has been written on the philosopher's stone, with the contents of a treatise professing to convey a practical knowledge of the useful arts, for the sake of enlarging the volume, in order to raise the price, under pretence that valuable additions had been to the work.

The last performance of this kind was published under the assuming title of *the School of Arts*; from which name one might have hoped, if not for a complete system of knowledge of this kind, at least for somewhat better than the earlier writers had produced; especially as many amendments of the former practice, as well as the introduction into use of several important inventions, had furnished much ampler matter; but the author, instead of shunning their errors, or availing himself of the advantages the present state of things gave him over them, adopted with great augmentation all the defects and faults of those who had gone before him, and formed his work on a plan that deprived him of all opportunity of profiting of the greater advance towards perfection of the modern practice; for, being a German, (as I conjecture from his manner of changing the English idiom) he seems to have conceived, that nothing could be added to the labours of his countrymen; and has, therefore, with respect at least to those topics he has touched upon in common with this work, confined himself to translating and compiling from Künckel, and other Germans, who being of older date, could not supply him with the improvements and inventions of the present time. In consequence of which conduct, obsolete and insufficient methods are taught, instead of the modern and effectual; and many of the most material articles wholly omitted. In the instance of gilding, all the instructions are confined to metals; and with regard even to them, relate only to means now exploded; and many important matters strictly connected with his plan, are not once mentioned in the book, while others of much less consequence, as the method of crystallizing silver under the resemblance of a tree, are repeated four or five times over. Like Salmon, he gleaned also toge-

ther all the extravagancies he could lay hold of, in order to increase the size of the work to the bookseller's unreasonable standard; and therefore inserted in his first volume, a most preposterous and lying account of the breeding silk worms by putrified veal, and producing strange serpents by equivocal generation; and in his second volume, a dissertation on the catching, breeding, feeding, and teaching nightingales, which takes up sixteen pages; with a multiplicity of other such wretched absurdities in both, as greatly disgrace the title of *the School of Arts*, and conduce indeed, from their having been so often admitted into them, to make works of this kind in general contemptible. But what is still more unhappy in the case of this author, he appears neither to have understood the language he translated from, nor that he wrote in. Whence the recipes and observations he has given are so ill delivered, by his mistaking the sense of technical terms, and putting the name of one thing for another, with respect even to substances, as, together with the alterations he has had the vanity to make in them, from the manner they were given by those he took them from, according to his own gross misconceptions, render them frequently unintelligible, and not to be depended upon in many instances.

The pretensions of the ostentatious works, the Cyclopedias, and Encyclopedias, and other such dictionaries, have not been, however, much more made good than those of *the School of Arts*. For, indeed, it is surprising how shamefully silent these books, which profess to comprehend every thing relating to subjects of this kind, are with respect to most of the essential articles; even those where the writings of others, had they been industriously consulted, would have furnished what was required. Nor is the French Dictionary, now published, in the least an exception to this; for, on examining it, in order to have informed myself of the methods practised by the French, with respect to certain particulars in which they excel, I was surprised to find that, in some cases, every thing concerning them was entirely omitted, and in others, recipes, or other passages, taken from some of the old books with the most injudicious choice, supplied the place of the just account of the improved methods obtained from the ablest practitioners of the several arts, which, in the proposals

for this work, were promised to have been given. There is, among many others, a glaring instance of this in the article *Carmine*; which pigment, being prepared at Paris in much greater perfection than any other place at present, and of the greatest consequence in painting with water colours, was well worth the attention of the compilers of this work. But, instead of any account of the modern and efficacious practice of the preparation of carmine, which is not moreover a secret in the hands of a single person, but known to several, who make it together with other colours; all that is inserted on this head consists of three recipes taken from the old writers; two of which contain only directions for doing what will be barren of any useful product; and the other a bad process taken from Kunckel for making lake of Brasil wood, which is, nevertheless, praised as the communication of an excellent method of making carmine. I was indeed disappointed in my expectations from that work, with relation to this important article, as it has never been in my power to discover by experiments, or procure by information, the knowledge of the means of preparing carmine of equal goodness with that of the French. But I choose much rather to acknowledge my ignorance in this point, than, like the preceding writers, to give methods which are inferior to those of the improved practice, or to obtrude absurd and fruitless processes on the public, in the place of the proper and effectual.

I am sensible, I run some hazard of a retaliation, in canvassing thus freely the performances of others, since doubtless my own is not exempt from errors and defects. But I thought it a necessary vindication of these kinds of writings, and of my own undertaking in particular, to shew, that the cause of the disregard, or even contempt, in which the greatest part of the books of this kind are held by the more judicious, did not arise from the nature of the subject, but the faulty manner of treating it, through the insufficiency and venality of the authors. And with respect to my own miscarriages, I am so little conscious of having occasioned them, either by neglect, or a mercenary conduct, that I am not in the least diffident of trusting my work to the candour of the impartial, who will excuse some mistakes and omissions, which, in taking so great a scope of subject, it is almost impossible to avoid, on the

score of so many useful articles as will be found to be inserted; for, with respect to the far greatest part, I can avouch them to be authentic and just, either from my own experiments and observations, the information of persons of undoubted veracity who have practised them, or clear deductions from unquestionable principle.

Besides the articles mentioned above, there is a number of others of considerable importance added in this edition, and many of those contained in the first are also illustrated, or altered, where late improvements, or more extensive information, have given occasion to it. The value of the work is therefore consequently enhanced, as well as the volume enlarged; but the editor, notwithstanding the additional expence, has continued the book at the original price, deviating from the practice of former publishers of such treatises, who, when they have met with encouragement from the public, in the sale of one impression, have augmented the book with whatever matter they could find, in order to have a pretence to advance its price.

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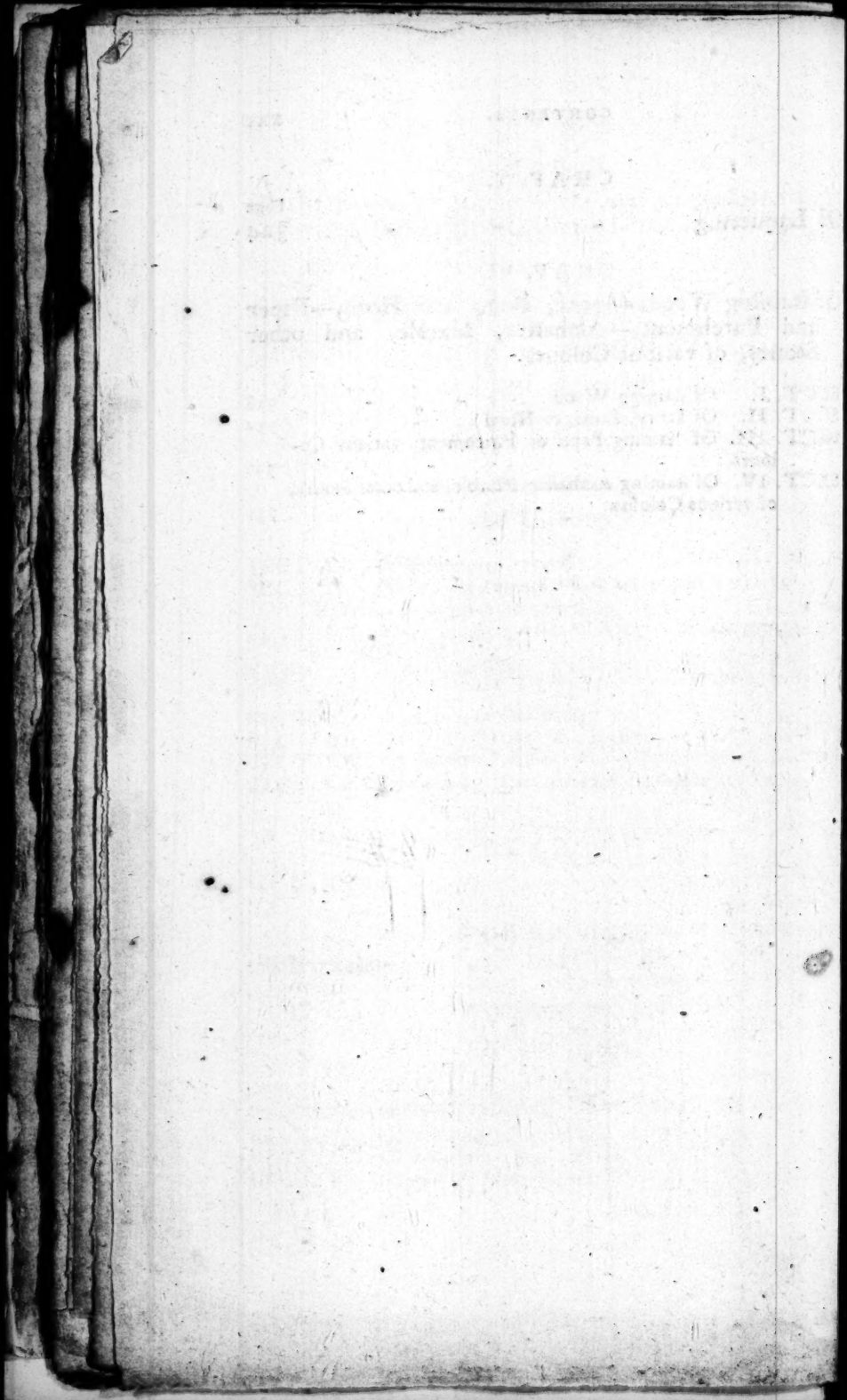
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and other parts.

PART I.

OF

THE MATERIA PICTORIA :

OR,

The Nature, Preparation, and Use of all
the various Substances employed in
Painting.

CHAP. I.

Of the Substances in general used in Painting.

THE principal kind of substances used in painting is the COLOURS : by which is to be understood, all the various bodies employed by painters, for producing the difference of hue or taint. But, as several of these are of a solid consistence, and an earthy or incohering texture, it was necessary, as well for the laying them on, and spreading them properly, as for the binding and making them adhere to the grounds on which they are laid, that, in many cases, somewhat of a fluid nature should be added to give them an unctuous consistence while used, and a proper degree of tenacity when again dry. To this end, many different kinds of bodies have been applied ; from whence proper VEHICLES have been formed, which, at the same time, answer the double purpose of reducing the colours to a state fit for their being worked with the brush or pencil, and of cementing them to each other and the ground they are laid upon ; as also defending them from being easily injured by accidents.

The substances used in painting may be therefore all considered as of these two kinds; *Colours* and *Vehicles*. For, though there are several used occasionally, which are not immediately subservient to the principal intentions of vehicles; yet, being employed to remedy the defects of those which are, they must be deemed as subordinate to them, and ought, consequently, to be classed with such as compose vehicles.

The nature of these secondary intentions I shall, therefore, point out in its due place; and reduce the substances serving to them to their proper classes accordingly. As it is necessary, in order to understand critically and completely the art of preparing and using the various articles of the *materia pectoria*, to comprehend clearly the general intention in which each is used, as well as to know the particular purpose to which it is applied. And, for the same reason, as also for the sake of being intelligibly concise, I shall treat of the whole under such methodical distinctions as refer to these intentions; adopting, nevertheless, on every occasion, the terms of art in common use; and explaining them, according to the meaning they bear, when applied with any propriety or precision, by the particular relation they have to these intentions.

CHAP. II.

Of Colours.

SECT. I.

Of Colours in general.

CLOURS may be either **PIGMENTS** or **FLUIDS**. By *pigments*, is meant all such solid bodies as require to be mixed with some fluid, as a vehicle, before they be employed as paints (except in the case of crayons, where they are used dry.) These make the far greatest part of

the whole; the fluid colours being only a small number of aqueous tinctures, which come into the class of water colours; and asphaltum, a bituminous substance, which is sometimes employed in oil painting.

Colours are distinguished into several kinds, according to the vehicles in which they are worked: as *oil colours*, *water colours*, *enamel colours*, &c. The same sorts of pigments, being however, as in many instances, employed in more than one kind of painting, as vermilion and lake in several, and ultramarine in all, I shall not distribute them into classes, in that view, till I come to speak of their particular application; but treat at present of them promiscuously in teaching their general nature and preparation; dividing them according to their affinity in colour only. As this method of arrangement will not only render each article more easy to be found; but, at the same time, exhibit, to the artist, together, the whole stock of every kind from whence he must take what he wants on each occasion; by which, he will be the more enabled to choose what may best suit his particular purpose. For the same reason, also, this method is certainly more expedient than the disposing them in classes, according to their natural relation to each other, as earths, minerals, vegetables, &c. which would lead to the like kind of confusion and repetition.

The principal qualities in colours, considered with regard to their perfection or faultiness, are two; *purity of colour* and *durableness*. Purity of colour is, by the painters, called BRIGHTNESS; and the defect of it, FOULNESS, or sometimes the BREAKING THE COLOUR. Durableness is called STANDING; and the negation or want of it, FLYING, or FLYING OFF. These terms, for conciseness, I shall use in speaking of these qualities.

Brightness and *standing* well are the only properties which are necessary to the perfection of every kind of colours; and they equally relate to all; but there are others which are essential to many sorts, with regard only to particular purposes and uses. Such of them, however, as do not fall within the general consideration of the nature of colours, will be treated of in those parts of the work where the particular uses of colours come in question.

The most considerable of the more general properties of colours, after *purity* and *durableness*, or *brightness* and *standing* well, are transparency and opacity: for according to

their condition, with respect to these qualities, they are fitted to answer very different kinds of purposes. Colours which become transparent in oil, such as lake, Prussian blue, and brown pink, are frequently used without the admixture of white, or any other opaque pigment. By which means, the teint of the ground on which they are laid retains, in some degree, its force; and the real colour, produced in the painting, is the combined effect of both. This is called **GLAZING**: and the pigments, indued with such property of becoming transparent in oil, are called *glazing colours*. The same holds good also of such colours as are transparent in water; only when they are there used in this manner, they are not called *glazing* but **WASHING** colours. When colours have no degree of such transparency in the vehicle in which they are used, as vermilion, King's yellow, and several others, they are said **TO HAVE A BODY** and **TO COVER**. The property of *glazing* or *washing* is of so much importance, both in oil and water, that no other method can equally well produce the same effect in many cases, either with regard to the force, beauty, or softness of the colouring. It is therefore very essential to the perfection of several kinds of pigments that they should possess this property in a complete degree; but, in other instances, the using colours with a strong body is not less necessary, especially for the grounding or *laying* in, as it is called, of many objects to be painted.

There is another material quality in colours, that relates only to their use in oil, which is the *drying* well, and (as it is called) not *fattening*. By **FATTENING** is meant, a coagulation of the oil, that frequently happens on its commixture with several kinds of pigments, by the effect they have upon it; from whence, after some time keeping, it is rendered of so viscid or glutinous a consistence, as to be wholly incapable of being worked with either brush or pencil. This quality, when found in them, destroys almost wholly the value of such pigments for the purposes of the colourman. As they sell a great part of them ground with oil, and tied up in pieces of bladder, where they are kept till there is a demand for them, which frequently does not happen soon; and, therefore, gives time for their spoiling in consequence of this quality. But to painters, who mix the colours for themselves, on their palette, with the oil,

this property is not an equal inconvenience, when in a lesser degree. Only, in general, it must be observed, that colours, in proportion to their tendency to fatten, are slow in drying; and when the oil once contracts this state, it will be a very long time before it will become duly hard and firm in the paintings.

There are two other qualities of colours in general that relate only to their teint or hue; but which render them nevertheless fit or improper, in a very material degree, for different purposes. They are distinguished by the names of WARMTH and COOLNESS: terms which indeed are used very frequently by painters; but for the most part, very indefinitely, and without any precise or clear meaning. What is meant, when properly used, by warmth, is that fiery effect which a small addition of yellow gives to a true red; and that glowing appearance which red imparts to either yellow or blue. By *warmth*, therefore, in red, is to be understood a small inclination towards orange; by the same term, applied to yellow, a like tendency by the admixture of red; and, by the same, again in the case of blue, must be understood its slightly verging on the purple. By *coolness*, is to be understood, the opposite to warmth. But this term is seldom used, except in speaking of yellow and blue; and there it means either the negation of that which causes warmth, or a tendency to green, in either colour, by a slight admixture of the other.

The sense of the word *warmth*, when applied to colouring or the combined appearance of various teints, must not be confounded with that which it has, when speaking of particular colours. For there it relates to the producing a strong effect, by the disposition or contrast of the colours, or the grossness of the teints; and not the qualities peculiar to, or inherent in the colours themselves.

The colours which may be used in all the several kinds of painting, except some peculiar to enamel, are as follow:

CLASS I.

RED.	Vermilion.	} <i>Scarlet, or tending to the orange.</i>
	Native cinabar.	
	Red lead.	
	Scarlet ochre.	
	Common Indian red.	
	Spanish brown.	} <i>Crimson, or tending to the purple.</i>
	<i>Terra di Sienna, burnt.</i>	
	Carmine.	
	Lake.	}
	Rose pink.	
	Red ochre.	
	Venetian red.	

CLASS II.

BLUE.	Ultramarine.	}
	Ultramarine adhes.	
	Prussian blue.	
	Verditer.	
	Cendré blue; or, sanders blue.	
	Indigo.	
	Smalt.	
	Bice.	
	Litmus; or, lacmus.	}

CLASS III.

YELLOW.	King's yellow.	}
	Naples yellow.	
	Yellow ochre.	
	Dutch pink.	
	English pink.	
	Light pink.	
	Gamboge.	
	Malticot.	
	Common orpiment.	
	Gall stone.	
	<i>Terra di Sienna unburnt.</i>	
	Turbith mineral.	
	Yellow-berry wash.	}
	Turmeric wash.	
	Zedoary wash.	
	Tincture of saffron.	}

CLASS IV.

GREEN.

- Verdigrise.
- Distilled verdigrise; or, crystals of verdigrise.
- Prussian green.
- Terra-verte.
- Sap green.

CLASS V.

ORANGE.

- Orange lake.

CLASS VI.

PURPLE.

- True Indian red.
- Archal.
- Logwood-wash.

CLASS VII.

BROWN.

- Brown pink.
- Bistre.
- Brown ochre.
- Umbre.
- Cologn earth.
- Asphaltum.
- Spanish juice; or, extract of liquorice.
- Tobacco water.

CLASS VIII.

WHITE.

- White flake.
- White lead.
- Calcined hartshorn.
- Pearl white.
- Troy white.
- Egg-shell white.
- Flowers of bismuth.

CLASS IX.

BLACK.

- Lamp black.
- Ivory black.
- Blue black.
- Indian ink.

These are the colours at present in use, in this country, in any kind of painting, except such as are peculiar to enamel. In which method of painting, as but few of them are capable of combining with glass, and enduring

the necessary heat without changing their nature, or being destroyed, others are employed more suitable to vitrification. On which account, as the compositions for forming the enamel colours are very various, and bear no particular names, and the management of them has very little relation to other kinds of painting, I shall omit speaking of them till I come to treat particularly of enamel painting.

Of the above enumerated colours, but few are in universal use; most painters having only a select set out of them, and being, in general, unduly prejudiced against those they reject. And some of the best of them, as scarlet ochre, *terra di Sienna*, *terra verte*, true Indian red, and umbre in oil painting, and bistre and gall-stones in water-painting, are, either through their scarcity, or the ignorance which prevails concerning their qualities, at present very little regarded; though some of them were formerly in common use; and all of them might be so with great advantage to the art.

It is no little impediment to their improvement in the profession, that painters are not more extensively acquainted with all the substances fit for their purposes; and more minutely informed of the good as well as the bad qualities of what colours they might use. For many labour under great disadvantages for want of a more copious choice, and the not being better apprized of some of those which suit their own particular manner of working; as it would, in many cases, remove difficulties out of their way, by enabling them to produce effects by more simple methods, and such as are also more correspondent to their manner, than those they are now obliged to pursue from their defect of proper colours.

As colours are obtained from very various substances, the means of preparing them are, consequently, very various: some being of a simple nature, and requiring only to be purified, and reduced to a proper consistence or texture; and others being compounds of different bodies, to be formed only by complex and elaborate processes. It is therefore very difficult to give such general directions, for the making every sort of colour, as may be intelligible to all; the utensils to be employed, as well as the methods to be pursued, being such as belong to different arts and trades. But as the greater part may be done most com-

modiously by adopting the methods used for performing the common chymical processes, it is the most expedient way to treat of them correspondently to such a view. As by that means, any who may make themselves acquainted with the common practice of chymistry, for which there are a number of books that afford sufficient assistance, may easily understand the whole art of making colours, when taught in this manner. For the sake, however, of those who may want leisure or disposition to proceed by this method, I will prefix such a description of the instruments, and explanation of the general nature of the operations, as, together with the particular directions given in each process, may enable even such as are wholly ignorant of chymistry, if they give a due attention, to get over this difficulty. As indeed, without such a previous knowledge of the nature of the instruments and operations, it would be impracticable to attempt to prepare several of the most valuable colours.

Where, nevertheless, simple means, and the use of such utensils as are generally known, may be sufficient to perform what is wanted, I shall avoid all technical terms, and more complex methods of operation; confining myself to such a manner of instruction as may be universally intelligible.

SECT. II.

Of the Utensils, Instruments, &c. subservient to the making and preparing Colours.

THE apparatus or set of utensils, &c. necessary for making the several colours used by painters, consists of a furnace for subliming vermilion;—another for subliming King's yellow;—a third for calcining ultramarine, the coal for Prussian blue, ochres, &c.—sublimers;—a pewter boiler with its proper furnace;—a *balneum marie*;—filters;—boards for drying the pigments;—levigating mills, mortars and pestles, stones and mullars; with several other smaller implements subservient to these.

As several of these implements are in common use for other purposes, and consequently to be had ready made of a proper constructure, I shall only enumerate them, without entering on any particular description of them: but

with respect to that part of the apparatus which relates to the more secret arts of making several of the colours, and has any thing peculiar in its fabrication, I will endeavour to give such a conception of the proper figure of every particular, and such directions for their construction, as may enable any to procure them to be made by proper workmen. Since, without this previous information of the necessary means of performing them, the giving the recipes or processes alone for making the colours would be of very little consequence: and as, moreover, by this method, I avoid the necessity of repeating frequently the instructions for those particulars, which when given in a more general way will serve effectually for a multiplicity of occasions.

The furnaces are of the most difficult construction of any part of the apparatus for making colours; being most remote from common experience and conception, and yet it is indispensibly requisite that they should be completely adapted to the purpose they are intended for. I shall therefore be very particular in my directions concerning them; but, before I enter on that task, it may be previously necessary to teach the manner of making a composition, which I shall have occasion to direct the use of frequently in my instructions for the building them, as well as on other occasions. I mean the lute for making good the junctures that suffer a great heat, and securing bodies of a tender nature from the effects of the fire. This I shall call here, as is done elsewhere, the *fire-lute*; the composition of which is as follows:

“ Take of green vitriol, or copperas, any quantity;
 “ and put it into an earthen pipkin, of which it may fill
 “ only three parts. Set it on a common fire, taking care
 “ that it may not boil over, which will be very liable to
 “ happen if the fire burn too briskly. When it has almost
 “ done boiling, throw in more of the vitriol, the quantity
 “ at first thrown in being now shrunk and contracted; and
 “ let that also boil to dryness; repeating this till the pip-
 “ kin be near full of the dried matter. Raise the fire then
 “ round it, and let it continue in as strong a heat as can
 “ be conveniently made, till the whole contents become
 “ of a red colour; after which take the pipkin out of the
 “ fire; and, being cold, break it, and separate the calcin-
 “ ed vitriol from it. Take then of this calcined vitriol,

"powdered, two parts, of the *scoria* or clinkers of a smith's forge, finely levigated,—Sturbridge clay or Windfor loam, dried and powdered,—and fine sand, each one part: mix them well together, and then temper them, with the blood of any beast, till they become of the consistence of mortar; a twentieth part of the weight of the whole of, short hair being beaten up with them."

The several furnaces necessary for making the finer kinds of colours are; those for *subliming cinnabar for making vermilion*;—for *subliming King's yellow*; and for *calcining blood for making Prussian blue, ochre, ultramarine, &c.*

The FURNACE FOR VERMILION, as well as the operation to be performed in it, are of the most nice nature of any objects relating to the art of making colours: it is indeed so difficult a thing to manage well the manufacture of vermilion, that it is given up in general in this country, even when the price of quicksilver would make it very profitable; and the greatest part, if not the whole of the consumption, is supplied from Holland: but if any will prepare well the apparatus, as here directed, and execute properly the process given below, they need not doubt, with some experience, but to be able to carry on this manufacture as well as the Dutch. The manner of constructing the furnace may be as follows:

The first step must be to procure the proper iron-work, which consists of bars for bearing the fuel,—a frame,—the doors for lighting the fire,—a strong plate for supporting the brick-work over them,—an iron frame and stopper for feeding the fire,—and an iron ring for laying over the top of the furnace, for the better hanging the bodies or subliming vessels in it.

The bars should be of hammered iron, eight in number, eight inches in length, a quarter of an inch in breadth, half an inch in depth, and fixed firmly by each end, at the distance of a quarter and an half quarter of an inch from each other, into two strong cross-bars; which cross-bars must be sufficiently long to admit of their suffering the brick-work to have good hold of them; and must be made flat at their ends, on that account.

The frame and door must be also of hammered iron. They may be of the length of the area or fire-place as formed by the bars; but need not be more than four inches

high. They should be of the usual form of those made for the furnaces of coppers, but stronger; and it is better to have the latch bigger than is common, and carried across the whole door; which will give it strength to resist the weight of the fuel, that otherwise, when the iron is softened by violent heat, is apt to force the middle part outwards.

The iron bar to lay across the frame of the door may be three inches in breadth, and about three inches longer than the frame itself; it may be either of cast or hammered iron, as shall be most easy to be procured.

The frame and stopper for feeding the fire should be also of hammered iron; the frame may be four inches long, and three inches high. It may be formed of four plates of a moderate strength; of which those of the top and bottom must slope downwards towards the fire in a parallel; they must also project beyond their joining with the side plates, in order to their being fixed in the brick-work. The stopper must be formed of five plates, put together in fashion of a box, (as in the doors of portable iron furnaces) and of such figure and proportion as to slide into the hole formed by the frame, and fill it up exactly, so as to render that part of the furnace entire, when it is not taken out occasionally to feed or stir the fire. The hollow of this box or stopper must be turned towards the fire, and filled with fire-lute; and a handle must be fixed in the middle of the outward part, for the more commodious use of it when hot.

The iron ring for hanging the bodies or subliming vessels in the fire must be made of cast iron. It should be of about four inches depth, and of a conic form, converging outwards. It should have an outward rim, or margin turning off from the ring horizontally, in order to its lying on the brick-work of the furnace. The diameter of the ring must be in proportion to the size of the sublimer to be hung in it: it should be about two inches wider in the lower parts than their diameters; and must diverge or enlarge itself upwards half an inch.

The iron-work being thus prepared, and a proper quantity of Windsor bricks, and the loam they are made of, or Sturbridge clay, as well as common bricks, and coal-ash, and common mortar, provided, the dimensions of the furnace must then be thus settled:

Take the diameter of the greatest sublimer intended to be worked in it, and add to it two inches to allow for the lute, if any should be used round it; then add twenty-two inches, and it will give the diameter of the whole area of the furnace.

The dimensions of the furnace being thus settled, the ground-plan must be made in the following manner:

A round of bricks must be laid of the diameter of the area of the whole fabric as settled above, and the bars must be laid in the centre of it, in their proper position; and a line drawn close at the back of the furthestmost cross-bar, which must begin a quarter of an inch beyond the insertion of the outermost of the long bars on one side, and extend to a quarter of an inch beyond the outermost bar on the other side. From the extremity of this line, two others must be drawn, parallel to the sides of the outermost bars, and extended to the circular line which marks the area of the whole fabric. The ground plan being so marked, a cylinder of brick-work must be raised in this circle, leaving a hollow square within the lines formed as above for the area of the fire-place and ash-hole. This cylinder must be carried up about eight inches, and may be built of common bricks and coal ash mortar; but they must be laid solid, that the whole mass may not shrink when subjected to a great heat. When this cylinder of brick-work is raised, the bars of the fire-place must be laid over the innermost part of the vacuity left for the ash-hole; and the door, with its frame, must be also placed in their proper position in the front of the bars, which will not be, in this manner of construction, on a level with the exterior surface or front of the furnace, as in those of the common kind, but only half the length of the bars from the centre of the whole furnaces. The brick-work must be then again carried up six inches higher, in the same manner as before; only it must be made to take proper hold both of the cross-bars of the fire-grate and the frame of the door; but in this part of the fabric the courses next the fire should be of Windsor bricks, and laid in Windsor loam, or Sturbridge clay.

The fabric being raised to this height, the iron plate prepared for that purpose must be laid over the opening of the brick-work, from the top of the door-frame to the exterior surface of the fabric, that the brick-work may be

carried entirely round about, and the cylinder of brick must be again proceeded with as before; only it must be now continued entirely round, forming only an area in the middle, which must be made sloping from that which is to hold the fuel, and must enlarge itself in such manner that in raising the furnace eight inches high, the diameter of the cavity may be equal to the diameter of the subliming vessel, with the addition of six inches, to allow for the space in which the fire must come round it on each side.

In the last course of bricks which raise the fabric to this height, the hole must be left for fixing the frame that is to form the opening for feeding the fire; which must be accordingly placed in it in such manner that the slope formed by the upper plates, which compose it, may incline towards the fire. The proper situation for this hole is in the front of the furnace, over the opening leading to the door of the ash-hole.

From this height the brick-work must be carried up, forming a hollow cylinder for four inches more; when a course of bricks, of which the inner ends are cut sloping, must be laid so as to contract the circle of brick-work to the diameter of the iron ring for supporting the sublimer, which must be then let into this opening left at the top of the furnace, and fixed with fire-lute; the bricks surrounding it being well pointed with the same. This part of the furnace, from the fire-place to the top, should be entirely built of Windsor bricks, laid with Windsor loam or Sturbridge clay.

In the last course of bricks must be left an opening of four inches length for venting the smoke into the chimney; over which opening an iron plate must be laid, and carefully pointed with fire-lute, that the air may have no access to spoil the draught. The chimney may be about sixteen or eighteen feet high, and the hollow about six inches square, or of an area equal to that, and need not be built of a greater thickness of bricks than is necessary in order to its supporting itself.

THE FURNACE FOR SUBLIMING KING'S YELLOW must have a sand-pot, as the heat of the naked fire would be too great. This pot may be of a greater or less size, according to the quantity of the King's yellow proposed to be made; but where there is no particular convenience in

varying from it, the ordinary size will be found most commodious.

The sand-pot being procured, as likewise the rest of the iron work, according to the preceding directions given for the furnace for vermilion, except the iron ring for the top of the furnace, which in this case must be changed into a flat rim of cast iron of four inches breadth, with a groove to receive the pot, and support it hanging in the furnace, the plan of the furnace must be made out in the following manner: The diameter of the pot being first taken, six inches must be added to it, for the cavity to admit the fire to come round the pot, and the length of two bricks to allow for the thickness of the sides of the furnace: these being put together give the diameter of the whole furnace. To find the due height, the depth of the pot must be first taken; to which must be added ten inches for the distance betwixt the pot and the bars; eight inches for the distance of the bars from the ground, with the height of a brick for a course that must be carried round the edge of the pot; which being all put together, give the height. The building may be then carried on, in the same manner as was before advised for the furnace for vermilion, till all be completed but the last course; and the rim must be then laid on the top of the brick-work, and well pointed with fire-lute: after which, when these parts of the furnace are so dried as to hold well together, the pot should be let down into the furnace, where it will hang by its margin or turned edge, resting on the groove made for it in the iron rim: and another course of bricks must then be raised, in a continued line with the sides of the sand-pot, that part of them which touches the pot being laid in fire-lute.

THE FURNACE FOR CALCINING THE PRUSSIAN BLUE, OCHRE, ULTRAMARINE, &c. may be of that kind commonly called a wind-furnace; and may be constructed in the following manner: First, prepare a set of bars, which may be a foot in length, and sixteen in number, with a strong frame and door, of which the breadth must equal that of the bars, and the height be a foot; as also a plate, or two strong flat bars, to support the brick-work over the door frame, and another to support the brick-work over the ash hole. A foundation or pedestal of bricks must then be raised about three feet and a half high, and two

feet four inches square; which may be done with common bricks and mortar; and need only, indeed, be four walls; the hollow formed by which may be filled up with rubbish, and filled over with bricks or tiles. On this pedestal, raise three other walls; one on each side, and one at the furthest end, of the whole brick thickness, forming an area betwixt them, of the length of a foot, and of the breadth of ten inches; of which area the front will necessarily be open, from the default of the fourth wall. Over this opening, in the front, lay the bars in the centre of the brick-work, and place along with them a plate that will reach from their edge to the extremity of the furnace, to bear the brick-work which must lie over that part of the hollow. Then carry up the sides as before, but with four walls instead of three, to inclose the area of the fire-place entirely, taking care that the first course have good hold of the flat ends of the cross-bars.

This part must rise eight inches above the bars, and then the door and frame must be fixed, and the other sides carried up as before.

When the building is carried to the height of the door and frame, the strong plate must be laid to bear the brick-work over it; and the hollow must then be made to converge, till it become so narrow as to form a chimney, of which the area of the cavity may be six inches square, or it may be turned into a funnel, or flue, to communicate with any other chimney, if such there be sufficiently near. But, as a wind-furnace demands a very considerable draught, if the flue be made from it into the chimney of any other furnace, which may not happen to be at work when there is occasion to use this, care must be taken to stop the chimney of the other furnace, below the admission of this flue into it, to prevent a false draught, which would otherwise entirely destroy its effects on the wind-furnace; and for this end registers should be always put to the flues, or chimneys below where the flues enter, of each furnace, whenever two or more vent themselves into the same common funnel.

SUBLIMERS must be of glass, and may be generally had ready made of a proper figure at the glass-houses, where glassies are blown for the common chymical purposes. They must be inquired for under the name of *bodies*, or cucurbits, which name they bear when applied to medicinal uses.

They should be chosen of a spheroidal form; neither the conical shape in which some, nor the oval in which others are made, being so commodious for subliming colours as a longish spheroid; but where they cannot be obtained of this figure, an oval may be dispensed with.

The magnitude of the sublimers must be determined by the quantity of matter to be sublimed, and the dimensions of the furnace; but those used in sand-pots should be always at least two inches less in the diameter than the pot in which they are to be placed; and those used in the naked fire should never be more than four inches less in diameter than the iron ring of the furnace in which they are to be hung.

Where vermilion is made in great quantities, earthen sublimers are used; but we shall speak of them in their proper place.

A REWATER-BOILER is necessary for boiling cochineal, brasil, or other woods, French berries, &c. for making lake, brown pink, Prussian blue, and many other pigments. It is requisite that this metal should be used for it, because iron and copper, as they will necessarily be corroded in a greater or less degree by the saline substances requisite to be used for making several sorts, are extremely injurious to the colours, and should therefore never be suffered to approach the finer kinds.

The form of this boiler may be cylindrical, with a bottom making a section of a sphere. Its dimensions should be three feet in depth, and one in diameter: but this may be varied, as the quantities of colours proposed to be made may vary the occasion. At the height of about two feet must be joined to it a strong margin or rim, by which it may be hung in the furnace; and a little above, must be two bow handles opposite to each other, by which it may be lifted in and out of the furnace. The whole must be wrought strong, as there will be frequent occasion to move it, when containing a considerable quantity of fluid.

The furnace for this boiler must be constructed in the following manner:

A rim of iron, such as was before directed to be used for hanging the sand-pot, together with the other iron work, must be first procured. The diameter of the boiler being taken, as also its depth below the rim by which it is to hang, the proceeding in the fabrication may be the same

as that of the furnace for the sand-pot, till the iron rim is to be fixed; when the course of bricks, which is raised upon the rim in that kind of furnace, must be in this wholly omitted. It is not improper, however, to allow two inches more distance in this furnace betwixt the boiler and the fire than was directed for the sand-pot, because the boiler may otherwise be more liable to be melted on any negligent treatment. When the boiler is used, it is to be lifted into the furnace, and hung by the rim, which must rest in the groove made for that purpose in the iron rim; and if it is to be emptied while the furnace is hot, it should always be lifted up with two or three gallons of fluid remaining in it; otherwise the bottom will be melted by the heat of the furnace: and, as the round figure of the bottom renders it not proper for standing of itself on the flat ground, a bass-work hassock or cushion should be made, sinking in the middle correspondently to the form of the bottom of the boiler.

A PEWTER BOWL, with a handle of proper length, should be had to the foregoing boiler, for lading out any matter boiled in it; as likewise an instrument of the same metal, made like a poker, but with a flatter end, for stirring about any solid matter that may be put along with fluids into the boiler.

RETORTS are useful for some purposes in the making colours; and glass receivers of various sizes for many. They may both be of the form in which they are usually found ready made at the shops and glass-houses; but it is proper to have some receivers very large, and with necks so wide, that the hand may be introduced into them to clean them thoroughly.

A BALNEUM MARIAE, or evaporating bath, is likewise necessary. It may be made by fitting a tin boiler, formed like the pewter one to the above described furnace; but it need only be a foot in depth below the rim for hanging it in the furnace, and only one inch in height above. To this boiler, a pewter vessel for containing the matter to be evaporated must be adapted. It must be at least two inches less in diameter than the boiler, and must have a rim like that of the boiler, by which it may rest on the edge of the boiler, hanging in its cavity.

Proper FILTERS are extremely requisite for the preparation of many pigments. They should be made of pewter,

in the form of the common earthen colanders, but with more, and larger holes; and their size should be such as admits of their interior surface being wholly covered by a sheet of filtering paper, when laid into them. Their edge should be turned outwards, so as to form a margin or rim, by which they may hang on a proper frame over the tubs, or other vessels, which are to receive the liquid they filter; and this frame may be only two narrow pieces of wood, of sufficient strength to bear the weight of the filter and its contents fixed together by two other cross pieces, at such distance, that the filter may just pass betwixt the four, and hang by the rim. For these filters must be provided proper paper; as also linen cloths to lay over or under the paper occasionally. The kind of paper fit for this purpose is that called *bloom* or *filtering paper*; but care must be taken in the choice of it; for it is difficult to find, in common stationers shops, such as will even moderately well answer the end.

For coarse colours, such as rose pink, flannel bags may be employed for expedition. They should be made in the form of pudding bags; and are called when applied to the same purpose in medicine, Hippocrates's sleeve. They should have proper frames for fixing them, which may be made of three sticks or wooden rods, fixed together at such a distance that the bag being hung upon them by three loops fastened to it, may have its mouth or opening subtend to a due width for pouring in the matter to be filtered.

Long boards must be likewise provided for drying colours. They should be made of sound wood, and very well plained; and it will be yet better, if the surface be made still smoother by varnishing them with seed lac varnish.

Chalk-stones are also proper on some occasions, for expedition, for the drying ultramarine, Prussian blue, washed ochres, and several other kinds; but they must never be used for lake, carmine, or any colours made of vegetable matter; for the alkaline quality of chalk may be very detrimental to such colours. Where Prussian blue is made in very great quantities, there is a particular apparatus used for drying it; but we shall speak of that in its proper place.

The levigation of colours, being of the most general use of any operation, is likewise required in many cases to be most perfectly performed; and, therefore, proper instruments subservient to it are extremely requisite. Hand-mills, and sometimes even horse-mills, are used for grosser sorts of pigments, or where very large quantities are to be despatched: but, as they are to be had of the proper workmen, duly constructed; it is needless to describe them here. In the case of vermilion, mills of different degrees of fineness are requisite: and that through which it is last passed should be of steel, and the most closely set that can possibly be wrought. But for this end, instructions here are unnecessary, as dependence must be had on those who are the proper makers of such machines; and who will succeed best in following their own methods. The muller and stone are generally useful, and should alone be depended on, at least for completing the levigation after the grinding them in the mills, whenever the colours are of any great value or nice use. Basons should likewise be provided for washing over the colours according to the manner below described.

SECT. III.

Of the general Operations subservient to the making or preparing of Colours.

THE operations subservient to the making and preparing colours, are *sublimation*, — *calcination*, — *solution*, — *precipitation*, — *filtration*, — and *levigation*.

As the practice of most of these operations is confined at present, in a great degree, to the purposes of chymistry, and therefore very little understood by any, except those who concern themselves in that art, I shall endeavour to explain them, as far as they relate to the preparation and treatment of colours. I shall also give such general directions for the performing them as may take away the necessity of repeating, on every occasion, those particulars which occur in almost all the processes that partake of the same nature; but with respect to such operations as are more commonly known and practised, I shall only touch on them in a more general way, without entering into minuter considerations regarding them.

OF SUBLIMATION.

SUBLIMATION is the raising solid bodies in fumes, by means of heat; which fumes are afterwards collected by condensation, either in the upper part of the same vessel where they are raised, or in others properly adapted to it for that purpose.

The end of sublimation is, either to separate substances from each other, in order to the purification of one of them, or to mix them more perfectly than can be effected without subjecting them to such a degree of heat as will necessarily render them volatile.

The means are, to put the matter, whether simple or compound, into a proper vessel or sublimer, and there give it a due heat, by placing it in a sand-pot, or the cavity of some furnace where the naked fire is required; in doing which the following particulars are the most material objects of attention.

The first care must be to provide glasses of the kind above-mentioned, page 42, and of a due size, which must be regulated, as was before mentioned, by the quantity of matter to be sublimed, and by the dimensions of the sand-pot, or cavity of the furnace where they are to be used.

The sublimer used for making King's yellow, or for any other operation to be performed in a sand-pot, need no previous preparation. But those to be used for vermillion, which must be placed in the naked fire, should be first well coated with the fire-lute; and a rim of the same matter must be worked round the coat at about two-thirds of the height of the sublimer, to support it in the ironing when let down into the cavity of the furnace. This coat of lute should be laid on of such thickness that it may be about half an inch thick when thoroughly dry, and if it be laid on at several distances of time, so that the first covering of the glass may be pretty dry before the second be put on, it will be the better; but great care should be taken that the whole be of sufficient dryness before the sublimer be let down into the furnace, and that the rim of lute fit well the iron rim; for otherwise ill success will most likely attend the process of the operation. In default of the fire-lute, the following may be substituted in its place for the coating sublimers; and is indeed, on account of its cheapness, most commonly used, though greatly inferior to the other with respect to the security of the glasses.

“ Take of Windsor loam, or very good common loam,
 “ fine sand, and dung of horses which feed on hay, each
 “ equal parts; temper them with water, or the blood of
 “ any beast, and beat them well together.”

To fix the sublimer in the sand-pots, an inch and half, or two inches of sand must be first put into the pot, on which the sublimer must be gently set; the pot must then be filled with sand up to the brim, and the matter to be sublimed must be put into the sublimer through its neck or mouth, which must be afterwards covered by a piece of tile, or flat glass, laid loosely upon it.

The sublimer used without a sand-pot must be fixed in the cavity of the furnace, by letting them through the ring of iron on the top of the furnace, till they hang by the rim of lute. After which the joint, formed by the rim and ring, must be made good by pointing with the fire-lute; which must, however, be of a dryish consistence, and used sparingly, lest it moisten the lute of which the rim is made, and causing it to give way, occasion the sublimer's slipping through into the furnace.

The sublimer being fixed, the fire must be lighted, but must be kept in a moderate degree till the lute be thoroughly baked; when, being increased, the matter will rise in fumes, and form itself in a cake on the upper part of the glass. This may be urged forwards by raising the fire as strongly as it will bear to be without forcing the fumes out of the mouth of the sublimer; which, if it appear to happen, must be remedied as quickly as possible by abating the heat. But proper care must be taken that the mouth of the glass or sublimer be not choaked up by the subliming matter; for which reason, the tile, or piece of glass which covers it, should be lifted up at proper intervals, and an opening made, with the end of a tobacco-pipe, into the cavity of the sublimer. On the neglect of this caution, the glasses are very liable to be burst by the rarefaction of the fumes, on the fire's burning briskly. When no more fumes arise, which may be known by the abatement of the heat in the upper part of the sublimer, notwithstanding the fire be equally strong, the operation may be concluded to be completed, and the furnace being suffered to cool, the sublimer must be taken out and broken, and the cake of sublimed matter in the upper part of the glass collected, observing carefully that it be

cept free from the dross or *caput mortuum* left in the bottom.

OF CALCINATION.

CALCINATION is the operating on substances, by means of heat, so as to produce some change either in their texture or colour.

Calcination is sometimes performed by exposing substances to the fire with as great extent of surface as possible; in the case of lead for converting it into the red lead or *minium*, and antimony to prepare it for its conversion into glass. In other cases it is performed by putting the substances into a crucible, or other such vessel, in a more collected body, and surrounding the vessel with fire; and there is a case indeed, viz. that of the masticot, where bringing it near the fire will be sufficient.

The red lead, red ochre, and antimony for making the glass, being calcined in large quantities by those who make their sole business, and have large furnaces like ovens constructed for these particular purposes, I shall be less explicit with regard to them; as it will be scarcely worth while for any, but those who carry it on as a gross manufacture, to concern themselves with them, unless as a speculative experiment.

The calcination of other substances for the preparation of colours may be performed by putting the matter into a crucible; and placing it in a common fire; or, where greater heat or room is required, in the wind-furnace described, p. 39, where the fire must be raised round it, and continued of such a degree, and for such a duration as the occasion may make necessary.

This may be understood to be all that is requisite where calcination is ordered in the processes below given, without any particular direction for the manner of performing; but where such direction is needful, it will be found to be inserted as each occasion occurs.

OF SOLUTION.

By SOLUTION is meant the reducing any solid body to a liquid state by means of another, into which, being put, it is dissolved or converted itself also into a state of fluidity.

This is performed by the simply putting one body to the other and mixing them well together, except in some cases where heat is necessary to expedite the effect.

When therefore bodies are ordered in the processes below given to be dissolved in others, it is only to be understood that they are to be put together, and stirred or shaken at proper intervals, till the solid body be melted. But where that appears to proceed too slowly, the vessel must be put into a proper heat to accelerate the operation, though this heat should be always understood to be less than will make water boil; except where the contrary be expressly directed.

OF PRECIPITATION.

PRECIPITATION is the re-separating a solid body from a fluid one, in which it is dissolved or melted, by the addition of a third body, which is capable of producing that effect. As for example, if seed-lac be dissolved in spirit of wine, and water be added, the seed-lac will be precipitated, that is separated from the spirit in which it was dissolved, and reduced to the state of an impalpable powder, which will subside to the bottom of the vessel containing the mixture.

The means of precipitation are therefore equally simple with those of solution, there being nothing more required than to put the matter, which is to suffer the precipitation, into a proper vessel, and to add that which is to cause it; and when the effect is produced, to separate the fluid from the solid body precipitated, by pouring off what can be so parted from it, and draining off the rest in a filter.

OF FILTRATION.

FILTRATION, though a very simple operation, yet when it is required to be done through paper, and great quantities of fluid are to be filtered, demands some nicety and judgment in the management of it; otherwise accidents are very liable to happen, which retard greatly the work, and occasion frequently much delay and trouble, especially with those who are unpractised in it.

The end of filtration is of two kinds; the one to free fluids from any solid bodies of a feculent nature with which they are mixed; the other, to separate any precipitate

powder, or other solid body, from superfluous fluid. The means must be varied accordingly. In the first case, paper, if it be of a right kind, is sufficient; in the other case, a coarse linen cloth must be put over the paper; otherwise, in taking the filtered matter out of it, parts of the paper will unavoidably mix themselves with it, and irremediably foul it.

Where filtering through paper is necessary, the pewter colander, described p. 42, will be found extremely commodious. But great care must be taken to accommodate rightly the paper to the colander, as well as to pour the matter very slowly into it at first, till it be well settled; for on neglect of this caution the paper will be very apt to burst, and delay the operation, by fouling the vessels with the unfiltered matter. If, as frequently happens, the paper which is procured prove of a bad texture, and wants tenacity to bear the weight of the fluid poured into it; or when the fluid itself may be of a very relaxing nature, and weakens the paper, a coarse linen cloth should be always used with the paper, whatever the intention of the filtering may be. For, though the fluid will pass faster through paper alone, yet much time will be saved from adding the linen, by preventing the troublesome accidents that will else unavoidably occur.

In filtering large quantities it will be frequently found, that, after the paper has been for some time soaked in the wet, the operation will proceed very slowly: the swelling of the substance of the paper, as well as the foulness of the fluid, diminishing, and at last choking up the percolating pores of the paper. When this is the case, the paper should be always changed, as soon as it is perceived that the filter ceases to run moderately; for, otherwise, the operation becomes intolerably tedious.

Where great quantities of more ordinary colours are made, such as rose pink, the kind of Prussian blue used for paper-hangings, or other such grosser kinds, the flannel bags mentioned, p. 43, may be used; as the filtering such great quantities of fluid through paper would be almost an endless labour. In doing this, nothing more is required than to hang the bags on the frames by their loops, and to feed them with the matter to be filtered; only the first quantity which runs through, being apt to

be foul, must be returned into the bag, till it be perceived that the fluid come clear.

OF EVAPORATION.

EVAPORATION, or *the reducing moist bodies to dryness by an artificial heat*, where it is not required to be in *balneo mariae*, may be performed by boiling in any commodious vessel, till the matter be freed from all humidity; the vessel being fed with a fresh supply as the fluid appears to be diminished. But in the case of vegetable or animal substances, where they are to be evaporated to dryness, or to a thick consistence, as in the artificial gall-stones, lake, or brown pink, it ought to be performed in *balneo marie*. This is done by putting the vessel containing the matter into another filled with water, and kept of a boiling heat; for, by this means the substances are prevented from burning into the vessel as they grow dry, which would otherwise unavoidably happen.

The evaporation in *balneo marie* may be commodiously performed in the vessels I have described, p. 42, by fixing the tin boiler in the furnace, and hanging the pewter vessel in it by the rim; the remaining cavity of the tin boiler being filled with water, and made to boil till the matter be brought to a proper dryness or consistence. This is all that is requisite where the quantity of matter remaining after the evaporation is large; but, where it is small, it is better to use some smaller vessel; as it would be so diffused on the sides and bottom of the pewter one as would render it difficult to be collected. The best expedient for this is to use a China basin of a proper size, and to hang it by packthread to two sticks laid across the edge of the boiler, and fixed at a proper distance from each other, by two other sticks tied to them crossways; by which little machine the basin may be suspended in the boiling water; and being fed with the fluid to be evaporated, as proper room appears in it for a fresh supply, will perform the office extremely well. But where the quantity of fluid to be evaporated is great, though the remaining matter when dry be small, a previous evaporation by the naked fire may be used till the quantity be properly reduced; taking care that the matter do not acquire so

thick a consistence as may subject it to burn to the sides or bottom of the boiler.

OF LEVIGATION AND WASHING OVER.

LEVIGATION of colours, where great quantities are in question, is performed in hand and horse mills; but this fails to produce so perfect an effect as the mullar and stone which is used in all other cases; the assistance of a pestle and mortar being indeed taken in the case of glass and hard bodies to prepare them for the mills or stone.

The method of using these several kinds of instruments, as well as the construction of the instruments themselves, are so well known that it is needless to dwell on any particulars regarding them. But the other method subservient to the intention of levigation (that is to say, to the reducing pigments to a due degree of fineness as powders) called *washing over*, being less generally understood, and yet of the greatest utility for procuring many colours in the most perfect state, I will explain fully the manner of performing it, which is as follows:

"The matter intended to be brought by this operation to an impalpable fineness, must be first well levigated, or if it be a body of chalky texture, as the ochres broken to a gross powder by pounding, then let it be put into a deep basin almost full of very clean water, and there well stirred about. Having rested a short time, that the grosser parts may sink to the bottom, let the water, together with the finer parts yet suspended in it, be poured off into another basin of the same kind, and suffered to stand at rest till the powder has totally subsided, and left the water clear. Let as much of this water as can without disturbing the sediment be then poured back into the first basin, and let the stirring, decantation, &c. be repeated as before, as often as shall be found necessary to separate all the powder that is of sufficient fineness. The remaining grosser part may be then again ground, and the same treatment continued till the whole of the matter be obtained in that state. This operation is, however, in some cases, to be repeated several times before the colour can be rendered so perfectly fine as may be wished; but when it is duly executed, pigments may be reduced to the most impal-

“ pable powders with great ease, even though, like ver-
 “ milion, they be of the most obdurate texture, and the
 “ ochres, or any such bodies of a chalky or clayey tex-
 “ ture as grow soft in water, may be freed from sand,
 “ stones, or other impurities, and rendered of the highest
 “ degree of fineness, even without any previous grinding.
 “ Where great quantities of water are to be washed over,
 “ as in the case of ochres, common Indian red, &c. tube
 “ must be had to supply the place of basons, and lading
 “ with a bowl-dish must be used instead of decantation or
 “ pouring of.”

SECT. IV.

Of the Nature and Preparations of particular Colours.

CLASS I.—OF RED COLOURS.

OF VERMILION.

VERMILION is a bright scarlet pigment, formed of common sulphur and quicksilver, previously prepared by a chymical process into a substance called *factitious cinabar*. It is one of the most useful colours in every kind of painting, except enamel or on glass; and it is of moderate price, spends to great advantage in any kind of work, and stands or holds its colour extremely well. It may be prepared in great perfection by the following process:

“ Take of quicksilver eighteen pounds, of flowers of
 “ sulphur six pounds: melt the sulphur in an earthen pot,
 “ and pour in the quicksilver gradually, being also gently
 “ warmed, and stir them well together with the small end
 “ of a tobacco-pipe. But if from the effervescence, on
 “ adding the latter quantities of the quicksilver, they take
 “ fire, extinguish it by throwing a wet cloth (which should
 “ be had ready) over the vessel. When the mass is cold,
 “ powder it, so that the several parts may be well mixed
 “ together. But it is not necessary to reduce it, by nicer
 “ levigation, to an impalpable state. Having then pre-
 “ pared an oblong glass body, or sublimar, by coating it
 “ well with fire-lute over the whole surface of the glass,
 “ and working a proper rim of the same round it, by

" which it may be hung in the furnace, in such a manner
 " that one half of it may be exposed to the fire, fix it in
 " a proper furnace; and let the powdered mass be put
 " into it, so as to nearly fill the part that is within the
 " furnace, a piece of broken tile being laid over the
 " mouth of the glass. Sublime then the contents with as
 " strong a heat as may be used without blowing the fumes
 " of the vermilion out of the mouth of the sublimer.
 " When the sublimation is over, which may be perceived
 " by the abatement of the heat towards the top of the
 " body, discontinue the fire; and, after the body is cold,
 " take it out of the furnace and break it; collect then to-
 " gether all the parts of the sublimed cake, separating
 " carefully from them any dross that may have been left
 " at the bottom of the body, as also any lighter substance
 " that may have formed in the neck, and appears to be
 " dissimilar to the rest. Levigate the more perfect part;
 " and, when reduced to a fine powder, it will be vermi-
 " lion proper for use; but on the perfectness of the levi-
 " gation depends, in a great degree, the brightness and
 " goodness of the vermilion. In order therefore to per-
 " form this, it is necessary that two or three mills of dif-
 " ferent closeness should be employed, and the last should
 " be of steel, and set as finely as possible, according to
 " what has been before mentioned in speaking of the ap-
 " paratus for making vermilion, Section II."

Where great quantities of vermilion are manufactured,
 it is a practice, for the sake of cheapness, and to save the
 labour of coating, with so much care, glass sublimers with
 lute, to have earthen ones made of the same sort of clay as
 that employed for long necks. When this is done, these
 sublimers should be of a spheroidal figure, and about an
 inch less in their least diameter than the ring of the sur-
 face in which they are to be hung; they must also have a
 rim worked at about two-thirds of this height, of the same
 matter they are made of, by which they may hang in the
 iron ring, as the glass sublimers, by means of the rim of
 the lute. It is much the best way, however, to give them
 a coat of good common loam, sand, and horse dung. In-
 deed, except for the sake of curiosity, or where none that
 is genuine and good can be otherwise procured, it is never
 worth while to go through the process for making vermi-
 lion where great quantities are not to be prepared; for it

is both troublesome, expensive, and very precarious with regard to the success of the operation to make small quantities.

The perfection of vermilion is to be of a very bright colour, and of a great degree of fineness, and that is most esteemed which most inclines to a crimson hue. These appearances, besides the rendering it more advantageous for the purposes to which it is employed in painting, are the readiest proofs of its being unfophisticate.

Vermilion, when pure, will stand very well, whatever vehicle it be used with, and may therefore be depended upon for carnations, or the nicest purposes.

It is very usual, I might almost say general, for dealers to fophisticate vermilion with red lead, which renders it very liable to change, and lose its brightness, as the red lead is apt to turn black, whether used with oil or water. This adulteration, when made in a greater degree, may be perceived by the difference in colour betwixt the fophisticated and pure. For the red lead being considerably more of the orange hue than the vermilion, renders it less crimson: but to detect with certainty the fraud of mixing red lead with the vermilion, both with respect to the general fact and the proportion, the following means may be used.

“ Take a small, but known quantity of the vermilion
“ suspected to be adulterated, and put it into a crucible,
“ having first mixed with it about the same quantity, in
“ bulk, of charcoal dust; put the crucible into a common
“ fire, having first covered it with a lesser crucible inverted into it, and give a heat sufficient to fuse lead; when
“ the crucible, being taken out of the fire, should be well
“ shaken, by striking it against the ground. If the suspected adulteration has been practised, the lead will be
“ found reduced to its metalline state in the bottom of the
“ crucible, and being weighed and compared with the
“ quantity of cinnabar that was put into the crucible, the
“ proportion of the adulteration may be thence certainly
“ known; but if no lead be found in the crucible, it may
“ be safely inferred that no red lead had been commixed
“ with the vermilion.”

It is very necessary that vermilion should be extremely well levigated, as it both contributes to its brightness and spending further in the work; and this can scarcely be

effected by mills without the subsequent use of the muller and stone, though it has been usual for preparers to pass it off as it comes out of the mill; but whoever would have vermilion in perfection, especially for painting carnations or mixing with white, should improve its fineness by washing over.

OF NATIVE CINNABAR.

NATIVE CINNABAR is a pigment compounded of quicksilver and sulphur, and therefore differs in nothing from vermilion but in the manner of its production, and the being sometimes of a more crimson colour. Some persons of intelligence have, however, doubted whether there be any native cinnabar sufficiently bright and clear for the uses of painting, and consequently whether all that is brought hither from the East, or said to be so, be not factitious; there being none found in the European mines which can give reason to think otherwise. Native cinnabar is found naturally formed in the earth, though seldom, setting aside the doubt here mentioned, so pure as to be fit for the uses of painting, at least without being purified by sublimation; which operation, being probably not well known to those who have any concern in the finding it, has not been hitherto practised, as far as appears. On this account native cinnabar has as yet been scarce and dear; a great part of what has been sold as such, having certainly been factitious; but the crimson colour of some quantities, and the mistaken notion that it would stand better than vermilion, because it was a natural production, have made it to be coveted by painters who are curious in colours. It is, however, never worth their while to be solicitous about it, as it never excels the best vermilion in brightness, and as that may be likewise rendered equally crimson, if the proportion of sulphur be made only as one to six or seven of the quicksilver. Moreover, if there really were any superiority, with regard to standing of the native cinnabar to the other, there never could be any certainty of having it genuine.

When native cinnabar is used as a colour, there is no other preparation necessary than a careful levigation, which may be best performed with water on the stone; but whoever would have it in the most perfect state, must superadd

washing over to the grinding. It has been usual to wash this colour, as well as vermilion, in urine, juice of lemon, and other fluid substances; but there is not the least alteration to be made in it by any such means, if it be pure, for the reason before given with respect to vermilion.

OF RED LEAD, OR MINIUM.

RED LEAD is lead calcined, till it acquires a proper degree of colour, by exposing it with a large surface to the fire.

The bright orange colour of red lead might render it valuable in painting, if it would stand with certainty in either oil or water; but it is so subject to turn black when used with oil, and even sometimes when with water, that it is by no means fit to be trusted either alone or mixed with any other colours where the standing well is of consequence; except in hard varnishes, indeed, which, locking up the pigments from the air and moisture, renders their colour durable in almost all instances. For this reason red lead is seldom now employed in oil, nor very frequently in water, but for very gross purposes, or to make a ground for vermilion, which being slightly spread upon it, will go much farther than on any other ground. But even this is not adviseable where it is desired the colour should stand for a long time.

The goodness of red lead may be distinguished by the brightness of its colour; for whatever it is adulterated with, will of course diminish it; and it is on this account not so liable to be sophisticated as white lead, vermilion, and some other pigments. The adulteration, however, where any is suspected, may be easily detected by the following means.

“ Put an ounce of what is suspected into a crucible,
 “ with an equal bulk of charcoal dust, mixing them well
 “ together. Place the crucible in a common fire sufficiently hot to melt lead, covering it with another smaller
 “ crucible inverted into it. Continue it in the fire for
 “ some time, and then take it out, and strike it against the
 “ ground. The red lead will then be reduced to its metallic state, and being poured out and freed from the
 “ charcoal dust, may be weighed when cold, and will

" shew by its deficiency the proportion of adulterating
" matter."

OF SCARLET OCHRE.

SCARLET OCHRE is the ochrous earth, or rather iron, which is the basis of green vitriol, separated from the acid of the vitriol by calcination. It is of a broken orange scarlet colour; but for its great certainty of standing, in which it equals any of the native ochres, and its extreme great strength and warmth either as a ground or in the shades of carnations, it is nevertheless very valuable. It may be used as a colour in any kind of painting, (but in enamel it turns to a transparent yellow like brown pink, if the flux be strong) and is easily prepared in the following manner:

" Take of green vitriol or copperas any quantity, and
" being put into a crucible, of which it will fill two-
" thirds; set it on a common fire to boil (taking care
" that it do not boil over) till the matter be nearly dry,
" when it will be greatly diminished in quantity. Fill
" then the crucible to the same height again, and repeat
" the boiling and replenishing, till the crucible be filled
" with dry matter. Take it then from this fire and put
" it into the wind-furnace; or, if the quantity be small,
" it may be continued in the same fire, the coals being
" heaped up round it. Let the contents be calcined there
" till they become of a red colour when cold, which must
" be examined by taking a little of the matter out of the
" middle, and suffering it to cool; for so long as it re-
" mains hot the red colour will not appear, though it be
" sufficiently calcined. When duly calcined, take the
" ochre out of the crucible while hot, and put it into wa-
" ter, in which the parts of the broken crucible may be
" soaked likewise, to obtain more easily what shall adhere
" to them, and stir the ochre well about in the water,
" that all the remaining vitriol may be melted out of it.
" Let it then settle, and when the water appears clear,
" pour it off and add a fresh quantity, taking out all the
" broken pieces of the crucible, and proceed as before,
" repeating several times this treatment with fresh quan-
" tities of water. Then purify the ochre from any re-
" maining foulness by washing over; and, having brought

“ it to a proper state of dryness, by draining off the fluid
 “ by a filter, in which the paper must be covered with a
 “ linen cloth, lay it to dry on boards.”

COMMON INDIAN RED.

The COMMON INDIAN RED meant here is of an hue verging to the scarlet; but the true Indian red (of which I shall speak below) is greatly inclining to the purple, among which colours it may be well classed.

This common kind has been introduced as a counterfeit or substitute for the real kind brought from the East Indies; and has, by its cheapness, and serving equally well for common purposes, prevented that from being brought over for a long time. So that the true teint of the original kind, being in some measure forgotten, this has been gradually made to vary from it, till it is in fact a quite different colour. But though the common Indian red will not answer the ends of the true kind, it is yet a very useful colour for many other purposes; and is therefore, on account of its standing, and warm, though not bright colour, much used as well in finer as coarser paintings in oil. As it is made of the *caput mortuum* of vitriol after the distillation of *aqua fortis* and oil of vitriol, it is afforded at a very moderate price, and may be thus managed.

“ Take of the *caput mortuum*, or ochre left in the iron
 “ pots after the distillation of *aqua fortis* from nitre and
 “ vitriol, two parts, and of the *caput mortuum* or *colcothar*
 “ left in the long necks after the distillation of oil of vi-
 “ triol, one part; break the lumps found among them,
 “ and put them into tubs with a good quantity of water,
 “ and having let them stand for a day or two, frequently
 “ stirring them well about, lade off as much water as can
 “ be got clear from them, and add a fresh quantity, re-
 “ peating the same treatment till all the salts be washed
 “ out, and the water come off nearly insipid. The red
 “ powder which remains must then be washed over, and,
 “ being freed from the water, laid out to dry.

“ When this is designed for nicer purposes, it should be
 “ washed over again in basons; the gross manner of lad-
 “ ing it out of one tub into another not fitting it always
 “ completely to such ends.”

As it is now difficult to procure the *caput mortuum* left after the distillation of oil of vitriol from green vitriol, the oil of vitriol being now for the most part made from sulphur, the residuum of the distillation of *aqua fortis* when made with green vitriol may be used alone; but in this case the matter should be first calcined in the wind-furnace, p. 39, to give it a more purplish hue.

OF VENETIAN RED.

VENETIAN RED is a native red ochre, rather inclining to the scarlet than the crimson hue: it is not far different from the common Indian red, but fouler, and may therefore be easily prepared from mixing common red ochre with the colcothar or *caput mortuum* taken out of the *aqua fortis* pots, and washed over.

As it is generally used by house-painters in imitation of mahogany, it requires no other preparation than to be well ground with the oil with which it is used; but when, as is sometimes the case, it is used in miniature painting, it should be carefully washed over.

SPANISH BROWN.

SPANISH BROWN, or brown red, is a native earth found in the state, and of the colour in which it is used; it is nearly of the same colour with the Venetian red, but fouler. It was probably from its name brought originally from abroad, and was then most likely of a finer kind, but what is now used is the produce of our own country, being dug up in several parts of England.

It is used for grounds and primings for coarse work by house-painters, and by colourmen in the preparation of the cloths for pictures and other coarse work, but seldom in any more delicate paintings. It therefore needs no other preparation than freeing it well from stones and filth.

Though if any, who may be desirous to use it for nicer purposes, want to have it in a more perfect state, they may make it equal in fineness and purity to any other pigments whatever, by washing over. And if they can render it useful to them with regard to the colour, they may depend on its standing equally with any other pigments whatever, being a native ochrous earth, of which kind none are ever

known to fail, whether they be used of their natural teint, or changed by calcination.

OF CALCINED, OR BURN'T TERRA DI SIENNA.

The TERRA DI SIENNA is a native ochre brought hither from Italy in a state in which it is naturally found. It is yellow originally, (of its qualities in which state we shall treat in its proper place below) but when moderately calcined it becomes an orange red, though not very bright. Being, however, semi-transparent in oil, it is of great use where a strong brown red shade is wanted, as in the face in portrait painting, and on many other occasions.

The calcination may be performed by putting lumps of it, either in a crucible, or naked in a common fire, and continuing it there till the colour be changed from yellow to red in the proportion wanted; after which it must be well levigated and washed over.

It is scarcely ever used but in oil painting, having no advantage for other purposes over pigments much more easily obtained.

Terra di Sienna admits of no other adulteration, if it be had in the state in which it is naturally found, which is that of hard lumps. It may be distinguished from other ochrous earths by its semi-transparency.

With respect to the goodness of *terra di Sienna*, we have but one kind brought here; all difference therefore of one parcel from another must lie in their being more or less pure.

OF CARMINE.

CARMINE is a bright crimson colour, and is formed of the tinging substance of cochineal brightened with *aqua fortis*, by a process similar to that used for dyeing scarlet in grain. It is of great advantage in painting as well in water as varnish, both on account of its beauty and standing well; but it will not mix with oil so as to have the due effect in that kind of painting.

The preparation of this colour in perfection is kept a secret by those who prepare it. The greatest part of what is used here is brought from France; what is made in England not standing well in general, being apt to turn purple on the addition of any kind of white, or even

with the sweat of the hands or face. Mr. Godfrey, the chymist, is nevertheless possessed of a method of preparing it entirely free from this defect; and I have seen some parcels made by him which were equal to the best French I ever saw. The superiority of the French carmine, as well as of the scarlet dye, has been attributed to some qualities in the air and water of France; but nothing is more absurd than this supposition, as the air has very little concern in the production of carmine; and the qualities of the water, if different, might be artificially changed. But the difference itself betwixt the English and French carmine, which does not lie in the beauty of the colour, but in its durableness and fixt nature, clearly evinced a diversity in the preparation; and Mr. Godfrey's success leaves no room to doubt but that the carmine may be equally well made in this country, when we are thoroughly masters of the art. The extension of this art would be a considerable saving to the public, as at present we buy of France the far greatest part of what is consumed; which is more than can be easily imagined, till we recollect how frequent the use of red is grown among the English ladies; and that this is almost the only substance used in this country as a red paint for living faces.

The compilers of the new French Cyclopaedia have given two or three old receipts for the preparation of this colour; and afterwards recommended another, as preferable to them, taken from Kunckel; which, on examination, is only a process for making bad lake of scarlet rags. But rather than to insert such imperfect instructions for the making an article of great consequence, as may delude those who are earnest in their pursuit of this art into a fruitless expence of time and money, or to reveal some information which I owe to the confidence of a friend, to his disadvantage, I choose to be silent on this particular, till I can obtain a satisfactory recipe by means which leave me at liberty to publish it without breach of honour.

OF LAKE.

LAKE is a white earthy body, as cattle-fish-bone, the basis of alum or chalk, tinged with some crimson vegetable dye, such as is obtained from cochineal or Brazil wood

dissolved or taken up by means of some alkaline salt, and precipitated on the earth by the addition of some acid.

Lake is used in all kinds of painting (except enamel) but particularly in oil, where it supplies the place of carmine, which does not at all agree with that vehicle. It is valuable both for its brightness and crimson teint, which makes it useful for carnations to the portrait painters; for skies to the landscape or ship painters; and for flowers to those who paint still life. Its transparency in oil renders it also of great service in glazing, as it is called, over vermilion; and in painting scarlet draperies, and the red parts of the lips; and its acquiring a dark hue by this transparency, when used without the addition of any opaque pigment, gives it an unrivalled excellence in the shades of red draperies or other similar cases. Notwithstanding these meritorious qualities, lake is not at present universally approved; nor without reason; for there is a defect which makes it to be frequently rejected where its use can be avoided. This defect is the uncertainty of its standing, when prepared in that manner which most conduces to its perfection in other respects. For though some parcels will hold their colour entirely well, yet others prepared in the same manner, as far as art can assure it, will fly in a degree that makes the use of it destructive to any painting; and if this defect be effectually remedied, as it may be by securing the tinging particles by gums from all attacks of the air, yet that is generally at the expence of the brightness and transparency; the earth, which is the basis of the pigment, being locked up by the gums, and rendered incapable of being combined intimately with, or imbibing the oil. Besides the perfections of lake, which it may have in common with other colours, there is yet another that relates only to itself. This is the inclining to the scarlet hue, which makes it more valuable for almost all the purposes which it is applied to, and where this quality joined to the others happens to be found in it, there is scarcely any limits to be set to its value with eminent painters of any kind, as was shewn in the instance of a parcel made by an unknown person, supposed to be a member of the Royal Society, and vended by one Stocks, then a colourman in Newgate-street, which was afterwards sold by some of those who purchased it of him at two guineas an ounce.

Lake was most probably made from the colour found in the grains of the stick-lac, from whence it seems to have taken its name. But it may be made from a great variety of substances which afford a crimson tinge, though at present it is seldom prepared from any other than cochineal, scarlet rags, and Brasil wood.

The best of what is commonly sold is made from the colour extracted from scarlet rags, and deposited on the cuttle-bone, which may be done in the following manner.

“ Take a pound of the best pearl-ashes, and, having
“ dissolved them in two quarts of water, purify them by
“ filtering through paper; add then to this solution two
“ more quarts of water, and having put in a pound of
“ scarlet shreds procured of the tailors, (for they must be
“ entirely clean) boil them in the pewter boiler, described
“ p. 41, till the shreds appear to have wholly lost their
“ scarlet colour. Take them out of the solution and press
“ them well, dipping them after in water and pressing
“ them again, that all the fluid they have imbibed may
“ be got from them, in order to be put back to the rest.
“ Take then another pound of the scarlet shreds, and repeat the like treatment of them in the same solution, as
“ also a third and fourth pound. When this is doing,
“ dissolve a pound and half of cuttle-fish-bone in a pound
“ of strong *aqua fortis* in a glass receiver; adding more
“ of the bone, if it appear to produce any ebullition in
“ the *aqua fortis*, and having strained off this solution
“ through flannel, pour it into the other by degrees, observing whether it produce any effervescence on putting
“ in the least quantity; which if it do in any great degree, more of the cuttle-fish-bone must be dissolved in
“ *aqua fortis*, and the solution very gradually added till
“ no ebullition appear to be raised by it in the mixture.
“ If this be properly managed, the fluid will soon become
“ clear and colourless, and the tinging particles extracted
“ from the shreds, together with the cuttle-fish-bone, will
“ subside to the bottom and form a crimson sediment,
“ which is the lake. The water must then be poured off;
“ and two gallons of hard spring water must be put to the
“ lake, and well stirred about to mix them. This being
“ likewise poured off, after the lake is again settled to
“ the bottom, must be replaced by another two gallons;

“ and the same method must be repeated four or five
 “ times; but if hard water cannot be procured, or the
 “ lake appear too purple, half an ounce of alum should
 “ be added to each quantity of water before it be used.
 “ When the lake is thus sufficiently freed from the salts,
 “ it must have the water drained from it in a filter cover-
 “ ed with a linen cloth, which has been so worn as to
 “ have no knap or down remaining on its surface. After
 “ the lake has been drained to a proper dryness, it must
 “ be dropped on clean boards, by means of a proper fun-
 “ nel, through which the drops being suffered to pass, and
 “ rest on the board at proper distances, they will become
 “ small cones or pyramids; in which form the lake must
 “ be suffered to dry, and the preparation is then com-
 “ pleted.”

If the lake thus prepared be of a deeper colour than be desired, the proportion of scarlet threads may be diminished; or, if it be wanted yet deeper, they may be increased.

This lake, when the process succeeds well, will be very bright, and will stand equally to any whatever; but it is not so transparent and fit for glazing as that where earth of alum is the basis.

Lake may be prepared from cochineal in the following manner:

“ Take two ounces of cochineal, and boil it gently in
 “ a quart of clean water. Filter the solution through
 “ paper, and then add to it two ounces of pearl-ashes dis-
 “ solved in half a pint of warm water, and then filtered
 “ also through paper. Make then a solution of cuttle-fish-
 “ bone, as in the above process: and to a pint of it add
 “ two ounces of alum dissolved in half a pint of water.
 “ Put this mixture gradually to that of the cochineal and
 “ pearl-ashes, as long as any ebullition appears to arise;
 “ and proceed as to the rest according to the directions of
 “ the above process.”

This lake will be very fine, if luckily managed, and will stand extremely well; it will also be very scarlet if the cochineal and annatto be good.

PREPARATION OF A BEAUTIFUL LAKE FROM BRASIL WOOD.

" Take of Brasil wood (not coloured in the grinding
" by the addition of pearl-ashes) three pounds, and boil
" it an hour in a solution of three pounds of common salt
" and three gallons of water, and then filter the fluid
" through paper while hot; prepare then a solution of
" five pounds of alum in three gallons of water, which add
" to the filtered solution of common salt tinged with the
" colour. Make also a solution of three pounds of the
" best pearl-ashes in a gallon and a half of water, and pu-
" rify it by filtering; put this to the other gradually, till
" the whole of the colour appear to be precipitated, and
" leave the fluid clear and colourless; but if any appear-
" ance of purple be seen, add a fresh quantity of the solu-
" tion of alum by degrees, till a scarlet hue be produced.
" The proportion of alum must, however, in this case be
" nicely adjusted; for a small excess will cause part of
" the tinging matter to be dissolved again, which will
" appear by the fluid's being coloured; and in such case,
" a balance must again be made by the addition of a small
" quantity of the solution of pearl-ashes. When the fluid
" is thus rendered clear of colour, and the sediment, being
" subsided, appears of a crimson tint tending to scarlet,
" the directions in the first process must be followed in
" every point."

This lake cannot be confided in for either painting in oil or water; but in varnish, or for any other purpose, where it is defended from air, it is superior to any other whatever, on account of its great brightness and transparency.

It may be rendered safe, however, with respect to standing, if half a pound of seed-lac be added to the solution of pearl-ashes, and dissolved in it before its purification by the filter; but, in this case, two pounds of the wood, and a proportionable quantity of the common salt and water, must be used in the coloured solution. This will produce a lake that will stand well in either oil or water, and will sometimes be extremely beautiful, but it is not so transparent in oil as without the seed-lac.

The lake with Brasil wood may be made also with the addition of half an ounce of annatto to each pound of the wood, which will render it much more scarlet where it is so wanted. But the annatto must be dissolved in the solution of pearl-ashes; and not in that of the common salt along with wood.

The goodness of lake cannot be positively known but by the actual trial of it, which, with respect to its standing, requires some time; but its other qualities may be more easily judged of.

With respect to the brightness, its merit may be easily proved by grinding a little of it on a palette or stone, with white lead and oil; where it may either be judged of by the memory of those who are very conversant in the use of it, or by comparing it with a sample of any other. In relation to the transparency, it is also easy to judge of it, by grinding a little in the same manner, with oil only, where a muddiness will be perceived, if the lake be in the least opaque; or a little of it may be put in this state, on the glass of a window, where its thickness or clearness will of course be apparent to the minutest degree. This indeed is the only method used in general by colourmen for deciding on all the qualities of lake; but it is very inconclusive with regard to any but transparency. In respect to the standing of lake, it is much more nice and difficult to determine; and indeed there can scarcely be any certainty about it but by actual experience. The colourmen having put a small quantity of any which they are desirous to try on a window, in the manner just before mentioned, let it stand there for some time to see if the colour fly. Other persons think they have a more expeditious and certain, though less known method, by trying it with the juice of lemon; which, if the juice turn the lake to an orange colour, or make any other change in it, gives a proof, as they conclude, of the badness, or of the contrary, if no alteration be produced. But neither of these methods are infallible; for it is practicable to prepare lake which will undergo both these tests, and yet not stand well when used in a picture; though the standing the juice of lemon is some presumption that the lake will hold its colour, and the being altered by it is a pretty certain proof of the contrary.

There is another defect, with respect to some purposes, which is apt to be found in lake; it is the fattening in oil. This can be only known by grinding some of it in the oil, and keeping it the proper time in bladders. When, if it be found to have this fault, it may be deemed utterly unfit for the use of colourmen. If, nevertheless, it have no other bad qualities, it is not at all the worse for this, with regard to those who have no occasion to keep colours in bladders, but mix them as wanted on the palette.

There is another kind of lake brought from China, which is extremely beautiful; but as it will not mix well with either water or oil, though it dissolves entirely in spirit of wine, it is not of any use in our kinds of painting hitherto. This lake has, by some unaccountable blunder, got the name of *safflower* among those who paint in water, and has, indeed, been so called in more than one pamphlet written on the use of water colours. But there is not the least affinity betwixt it and the real safflower, which is the dried flowers of the carthamus or bastard saffron, and is a well known substance, as being a common dying drug.

OF ROSE LAKE, COMMONLY CALLED ROSE PINK.

ROSE PINK is a lake like the former, except that the earth or basis of the pigment is principally chalk, and the tinging substances extracted from Brasil or Campeachy (commonly called Peachy) wood.

As it never can be expected to stand when used with oil or sulphur, it is seldom employed for any purposes but the coarse work of house-painters, or for paper hangings, unless sometimes with varnish, where it is secured from flying; and, when beautiful, may be distributed for lake.

Rose pink may be prepared in the following manner.

“ Take Brasil wood six pounds, or three pounds of Brasil and three of Peachy wood. Boil them an hour with three gallons of water, in which a quarter of a pound of alum is dissolved. Purify then the fluid by straining through flannel, and put back the wood into the boiler with the same quantity of alum, and proceed as before; repeating this a third time. Mix then the three quantities of tincture together, and evaporate them till only two quarts of fluid remain; which eva-

"poration must be performed first in the pewter boiler;
 "and afterwards in the *balneo marie*; described p. 42.
 "Prepare in the mean time eight pounds of chalk by
 "washing over; a pound of alum being put into the wa-
 "ter used for that purpose, which, after the chalk is wash-
 "ed, must be poured off, and supplied by a fresh quanti-
 "ty, till the chalk be freed from the salt formed by the
 "alum; after which it must be dried to the consistence
 "of stiff clay. The chalk and tincture as above prepared,
 "must be then well mixed together by grinding, and af-
 "terwards laid out to dry where neither the sun nor cold
 "air can reach it; though if it can be conveniently done,
 "a gentle heat may be used."

The goodness of rose pink lies chiefly in the brightness
 of the colour and the fineness of its substance; which last
 quality depends on the washing well the chalk. The more
 the hue of rose pink verges on the true crimson, that is to
 say, the less purple it is, the greater its value.

RED OCHRE.

RED OCHRE is a native earth; but what is commonly
 used is made red by calcination; being yellow when dug
 out of the earth, and the same with the yellow ochre com-
 monly used. It is chiefly brought from Oxfordshire, where
 it is found in great plenty, and burnt afterwards, by those
 who prepare it, in large ovens. The quality it has, in
 common with other ochres, of standing infallibly, renders
 it very useful, as well in the more delicate as in coarser
 paintings in oil, notwithstanding it is not bright. But in
 order to its being fit for nicer purposes, it ought to be
 washed over; though for others, it may be used in the
 state in which it is found in the shops.

The cheapness of red ochre renders it scarcely worth
 while to adulterate it; but, either from such practices, or
 from the difference of their natural state, some parcels are
 greatly better than others. The marks of goodness are
 brightness of colour, and the being of a crumbly chalky
 texture, shewing no gritty roughness when rubbed be-
 twixt the fingers.

CLASS II.—OF BLUE COLOURS.

OF ULTRAMARINE.

ULTRAMARINE is a preparation of calcined *lapis lazuli*. It is, when perfect, an extreme bright blue colour, with a transparent effect in oil, and in some degree in water, and will stand, when used in painting, without the least hazard of flying, with whatever vehicle or pigment it be mixed. For these reasons, ultramarine is of the highest value in every kind of painting, being equally serviceable in all, even in enamel; and though the invention of Prussian blue, on account of its much lower price, has greatly lessened the use of it, yet this exclusion of it may be considered as an injury to painting in general, as the skies of landscapes, and many other parts of modern pictures, shew the loss of it by their changing from a warm, or clear blue, to a faint greenish or olive tint.

A great variety of methods have been taught and practised for preparing the ultramarine. The older methods were, after a calcination in a crucible, to mix a composition of pitch, resin, Burgundy pitch, soap, wax, and other ingredients, and to form a paste of them with the calcined matter. This paste was then put into water for several days, and afterwards dissolved, by successive quantities of warm water poured on it, till it let go the colour of the calcined *lapis lazuli*, which was recovered by the same means as is directed for the washing over colours in p. 51. This method however of employing a variety of ingredients in the cement was not only unnecessary, but injurious to the colour, which was never perfectly freed by the warm water from them; and for this reason, the methods have been continually varied by those who have attempted to prepare this pigment. I shall however give the best of the more modern, and subjoin one of older date, which I believe, nevertheless, to be equally good, though not near so troublesome.

“ Take the *lapis lazuli*, and break it into very small pieces, or rather a gross powder. Put it into a crucible, and cover it securely, to prevent the coals from falling amongst it. Calcine it then with a strong fire for an hour if there be any large quantity, or less

“ time in proportion, and quench it, when taken out of
“ the fire, in vinegar; stirring them well together, and
“ suffer it to remain in that state for a day or two. Pour
“ off then the vinegar, except what may be necessary for
“ moistening the calcined *lapis lazuli* in grinding; which
“ operation it must then undergo, in a mortar of flint or
“ glass, till reduced to the greatest degree of fineness those
“ means may effect. But, if it appear yet too hard to be
“ easily ground, give it another short calcination, and
“ quench it a second time in vinegar. The vinegar must
“ then be washed off from the powder, by the putting it
“ to several successive quantities of clean water; each of
“ which must be poured off when the *lapis lazuli* has been
“ well stirred about in them, and is again settled to the
“ bottom. It must then be ground on a porphyry stone,
“ with a mullar, till it be perfectly impalpable, and then
“ dried; in which state it is truly prepared to mix with
“ the following cement.—Take of Burgundy pitch, nine
“ ounces,—of white resin, and Venice turpentine, six
“ ounces,—of virgin wax, one ounce and a half,—and of
“ linseed oil, one ounce and a quarter. Mix them toge-
“ ther, by melting in a pipkin over the fire; and suffer
“ them to boil till they acquire so stiff a consistence that,
“ being dropt into water while of this boiling heat, they
“ will not spread on the surface of it, but form a roundish
“ mass or lump. The cement being thus formed, may
“ be poured out of the pipkin in the water, and made in-
“ to cakes or rolls for use. Of this cement, take an equal
“ weight with that of the calcined *lapis lazuli*, and melt it
“ in a glazed earthen pipkin; but not so as to render it
“ too fluid. Then add to it the calcined matter by very
“ slow degrees, stirring them together with an ivory spa-
“ tula till the whole appear perfectly mixed. Being thus
“ mixed, heat the composition to a something greater de-
“ gree, and cast it into a large basin full of cold water.
“ When it has cooled to a consistence to bear such treat-
“ ment, knead it well like the dough of bread, with the
“ hands rubbed over with linseed oil, till all the parts be
“ thoroughly incorporated with each other. Then make
“ the mass into a cake, which may be either kept till some
“ other convenient time in cold water, or immediately
“ proceeded with in the following manner: Put the cake
“ into an earthen dish or basin; the bottom of which

“ should be rubbed with linseed oil, and pour on it water
“ of the warmth of blood. Let it stand a quarter of an
“ hour; and as the water softens the cake, it will not
“ loose the finest part of the calcined matter; which, on
“ gently stirring the water, but without breaking the
“ cake or separating it into lesser parts, will be suspended
“ in the water; and must be poured off with it into ano-
“ ther vessel. The quantity of water must be then renew-
“ ed, and the same operation repeated a second or third
“ time; and as the mass appears slack in affording the
“ colour, it must be moved and stirred, in the manner of
“ kneading, with the ivory spatula, but not broken into
“ fragments or small parts; and when so much of the co-
“ lour is extracted as to render it necessary for the ob-
“ taining more, the heat of the water must be increased to
“ the greatest degree. The quantities of the calcined
“ matter (which is now the ultramarine) that were first
“ washed off and appear of the same degree of deepness
“ and brightness, may be put together, and the same of
“ those of the second degree, the last washings making a
“ third. The water being then poured off from each of
“ these parcels, put on a lixivium formed of two ounces
“ of salt of tartar, or pearl-altes, dissolved in a pint of
“ water, and filtered through paper after the solution is
“ cold. This lixivium must be put on boiling hot, and
“ the ultramarine stirred well about in it, and then the
“ mixture set to cool. The powder being subsided, the
“ clear lixivium must be poured off, and clean water put
“ in its place, which must be repeated till the whole of
“ the salts of the lixivium are washed away. The ultra-
“ marine must afterwards be dried, and will be then duly
“ prepared for use.

“ Another method of purifying the ultramarine from
“ the cement may be used, which is the pricking the yolks
“ of eggs with a pin, and moistening the matter to be
“ purified with the soft part that will run out, and work-
“ ing them together in a glass or flint mortar; after
“ which the mixture must be put into the lixivium, and
“ proceeded with as is above directed.

“ In order to free the ultramarine from that part of
“ the water which cannot be poured off from it without
“ carrying away part of the powder, let it be put in a deep
“ pot, such as the cups made for coffee. After the whole

“ is poured off that can be without loss, set the pot so on
 “ a table or stand, that strings put into it may hang be-
 “ low the bottom. Then take three or four thick threads
 “ of loose twisted cotton, and having wet them, put one
 “ end of each into the fluid; and let the other, being
 “ brought over the edge of the pot, hang three or four
 “ inches below the bottom of it. By this means the wa-
 “ ter, being attracted by the threads, will drop from the
 “ lower end till the whole be nearly drained away. The
 “ matter may then be poured upon a porphyry, or polith-
 “ ed marble, and suffered to dry.”

The other method I have proposed to give differs from the above only in the using virgin-wax and the best white resin melted together in equal quantities, instead of the more compound cement; and this gives up the colour, on its being infused in warm water, much sooner than the other.

The other methods of preparing ultramarine differ chiefly in the manner of separating the colour from the cement and feculencies; which some recommend to be done by squeezing and working the mass with the hand in warm water, after it has lain in some time to soften. Others advise the putting the mass in the form of a flat cake on a board in a situation somewhat declining from an horizontal position, and making water drop on the board above the cake, that it may flow through it, and wash out the ultramarine; to facilitate which, the parts of the cake must be frequently opened and stirred with a stick. But this method is more troublesome and less efficacious than that above given.

Ultramarine may be also prepared without any cement, by calcining it; and when levigated and washed over, soaking it in distilled vinegar made hot. The ultramarine will, in this way of preparation, be produced in greater quantities; but it will be lighter coloured than when refined by the cement. It is, however, a very good method of preparing it for the painting of skies, and some other uses.

As it is of the last consequence to the producing fine ultramarine that the *lapis lazuli*, of which it is made, should be good, this may be judged of by inspection from the deepness and clearness of the blue colour; and in order to be more certain of the value, it is proper to heat a small

piece red hot; which, if it retain afterwards its hardness and colour, may be accounted good. But if it become crumbly and turn brown, or appear to have specks of dullness, it may then be justly suspected, or rather condemned.

The different parcels of ultramarine produced from the same parcel of *lapis lazuli*, according to the above process, will differ greatly in their value: the manner of judging of which must be by the degree of brightness and deepness of the colour. There is however no being precisely certain of the worth of any, but by comparing it with a specimen of known value; and to do that with great accuracy, a little of each should be thinly rubbed on white paper, or mixed with white flax and oil, by means of the palette-knife, so as to form light tints of the same degree; where the brightness will shew itself more distinguishably than in darker.

Ultramarine, on account of its great price, is subject to be adulterated. This may be done by two substances, viz. a precipitation or magistery of copper made by alkaline salt, and fine smalt. The first of these is the most injurious, because the magistery of copper, if the ultramarine sophisticated with it be used in painting either with oil or water, will change its hue and turn black, particularly in oil; and in enamel painting, as soon as fluxed, it will become a green, and consequently make the effect of the ultramarine vary from what is intended. The latter, that is, the adulteration with fine smalt, is more difficult to be performed, on account of the hardness of the smalt, which being in fact a hard kind of glass, is scarce to be levigated by art, so as to be equally fine with the ultramarine, rendered impalpable by the calcination it has undergone. This adulteration of ultramarine with smalt does not deprave it with relation to enamel painting, as it will flux with the same proportionable tint according to the appearance which it has in its simple state; and used as a water colour, it will stand equally well with that unsophisticated; but in oil painting, though it will stand well, yet it will never mix kindly with the oil, but fall from it if the mixture be very moisty, or form a pasty substance, if it be stiffer, that will not work freely.

The adulteration of ultramarine, by the magistery of copper, may be easily detected, by pouring some diluted spirit of nitre on a small quantity, which, if there be any

copper, will soon dissolve, and form a greenish blue solution. The adulteration with fine smalt is more difficult to be distinguished if the smalt be finely levigated. One of the most certain methods of discovering it, is to put some of the suspected ultramarine into a cup of clear water and wash it over, examining the grosser part, if any there be, which remains when the finer is thus separated from it. By this means the smalt, if there be any, not being near so finely pulverized as the ultramarine, will be left, and being thus separated and compared with the ultramarine divided from it, the difference will become very sensible. The adulterated may likewise, if the proportion of smalt be not very small, be distinguished from the pure by trying with oil on the principle before mentioned, that smalt will not mix so kindly with oil as ultramarine. A very fine kind of smalt, loaded strongly with the colour, has been sometimes imposed for a coarse kind of ultramarine; but the difference of their working in oil will easily afford the means of distinguishing them, and if they be tried in enamel painting, the smalt will flux without any addition, being itself a glass, which is otherwise with respect to the ultramarine, as it always requires the addition of some vitreous body to flux it.

OF ULTRAMARINE ASHES.

The pigment called ULTRAMARINE ASHES, is the residuum or remains of the *lapis lazuli*, after the ultramarine has been extracted from it by the above given, or any similar process; but as the coloured particles which remain are mixt with those of another kind contained in the *lapis lazuli*, whether earths or metalline substances, these ashes must of course be much less valuable than even the worst ultramarine. Sometimes, nevertheless, when the operation of the extracting the colour from the calcined *lapis lazuli* has not succeeded well, a considerable share of the ultramarine is left behind with the recement, and greatly enhances the worth of the ashes; and indeed, as it is certain that what colour they possess, when genuine, will never fly, they always bear a good price. The appearance of these ashes is, that of ultramarine a little tinged with red, and diluted with white. But they are frequently

adulterated, and made by the sophistication to look better than they would in a genuine state. This adulteration renders them much less certain of standing, if, as it is most frequently the case, it be made by precipitating copper in the manner before mentioned in the case of the adulteration of the ultramarine. This is easily, however, detected by the method above given, of putting some of it into a small quantity of spirit of nitre, which, if there be any copper in it, will be tinged green. The ultramarine ashes are also sometimes adulterated with smalt, as well as the ultramarine itself; and the consequences of the sophistication are the same in this case as were before mentioned of the other. The means of detection are also the same. As the ultramarine ashes will not flux without the addition of some vitreous body; while, on the other hand, the smalt, being glass, requires no such addition to its fluxing with a proper heat.

The method of preparing the ultramarine ashes is as follows:

“ Take the cement of the ultramarine which remains after the colour is extracted, and mix it with four times its weight of linseed oil. Let the mixture be set in a glazed pipkin over the fire, and when it is thus boiled a short time put it into a glass vessel, sufficiently large to contain it, of a cylindrical figure, of which vessel the diameter must be small in proportion to the length. But care must be taken that the matter, when put into this glass, be cool enough not to endanger the breaking it. This glass must then be put into a *balneum marie*; which must be made as hot as possible without boiling, and kept there till the colour appear to be all subsided to the bottom. The oil must then be poured off till the colour appear to rise with it, and the remainder, with the colour in it, must be put into another glass of the same kind with as much fresh oil as will rise five or six inches above the colour. This glass must be treated in the same manner as the first, and when the colour has subsided, the oil must be poured off, and a fresh quantity put in its place. This having been likewise poured off, the colour must then be well washed, to free it from the remaining oil, first in boiling water, and afterwards in some of the lixivium above-mentioned made boiling hot also. As much of the lixivium being pour-

" ed off, when the colour has subsided, as can be sepa-
 " rated from it that way, the colour must be thoroughly
 " freed from the remainder by frequent ablutions with
 " clean water; after which the water must be taken off
 " by the means above directed for the ultramarine, till the
 " matter be of a proper degree of moisture for grinding.
 " It must then be thoroughly well ground on a porphyry
 " and washed over, that all the harder and insufficiently
 " calcined parts may be reduced to an impalpable pow-
 " der; in order to which, the remaining grosser parts, af-
 " ter the finer have been separated by the washing over,
 " must be again ground till the whole be perfectly fine.
 " The same means must be afterwards used to bring the
 " ashes to a dry powder that were before directed for the
 " ultramarine."

OF PRUSSIAN BLUE.

PRUSSIAN BLUE is the fixt sulphur of animal or vege-
 table coal, combined with the earth of alum, and may be
 made from almost any animal, and many kinds of vege-
 table substances; though from reasons of experience, it is
 generally made of the coal of blood only. It is used in
 all kinds of painting except enamel, and is prepared of
 many different degrees of brightness and strength, as well
 as of different tints, some parcels being, though rarely,
 of a true unmixed blue, but the far greatest part of a purple
 hue; though the proportion of the tinge of red, which
 causes the tendency to purple, is frequently in degree va-
 rious, according to the different manner of, or accidents
 attendant on the management of the process. With re-
 spect to standing, Prussian blue can neither be esteemed the
 most perfect, nor the most faulty colour. When it is very
 dark, that is, when the tinging particles bear a large pro-
 portion to the earth, or basis, it will sometimes stand ex-
 tremely well; but it is apt then to want brightness and be
 very purple. On the other hand, when it is light, or with
 a small proportion of the tinging part, it is more frequent-
 ly bright and cool, as it is called, that is clear of any mix-
 ture of red; but extremely subject to fly, or to turn to a
 greyish green. This is not however universal, for I have
 seen some very dark which has been pretty bright and cool,
 as likewise some that has been light which would stand

perfectly well. The common Prussian blue, however, found in the shops, which is prepared almost wholly at present by ignorant and fordid people, and sold at very low prices, can be very little depended upon in paintings of consequence. Whoever therefore would have this pigment perfect, should either prepare it, or procure it to be prepared in the proper and true manner; and then, considering the high price of ultramarine, and the foulness of indigo, it may be deemed an acquisition to the art of painting.

The Prussian blue may be prepared in perfection by the following process.

“ Take of blood, any quantity, and evaporate it to perfect dryness. Of this dry blood powdered, take six pounds, and of the best pearl-ashes, two pounds; mix them well together in a glass or stone mortar, and then put the mixt matter into large crucibles or earthen pots, and calcine it in the furnace described, p. 39, the top of the crucible or pot being covered with a tile, or other such convenient thing, but not luted. The calcination should be continued so long as any flame appears to issue from the matter, or rather till the flame become very slender and blue; for if the fire be very strong, a small flame would arise for a very long time, and a great part of the tinging matter would be dissipated and lost. When the matter has been sufficiently calcined, take the vessels which contain it out of the fire, and as quickly as possible throw it into two or three gallons of water, and as it soaks there break it with a wooden spatula, that no lumps may remain; put it then in a proper tin vessel, and boil it for the space of three quarters of an hour or more. Filter it while hot through paper in the tin collanders, described page 42, and pass some water through the filter when it is run dry, to wash out the remainder of the lixivium of the blood and pearl-ashes; the earth remaining in the filter may be then thrown away. In the mean time dissolve of clean alum four pounds, and of green vitriol or copperas two pounds in three gallons of water. Add this solution gradually to the filtered lixivium, so long as any effervescence appear to arise on the mixture; but when no ebullition or ferment follows the admixture, cease to put in more. Let the mixture then stand at rest, and a green powder will be pre-

“ precipitated; from which, when it has thoroughly sub-
“ sided, the clear part of the fluid must be poured off,
“ and fresh water put in its place, and stirred well about
“ with the green powder, and, after a proper time of set-
“ tling, this water must be poured off like the first. Take
“ then of spirit of salt double the weight of the green vi-
“ triol, which was contained in the quantity of solution
“ of vitriol and alum added to the lixivium, which will
“ soon turn the green matter to a blue colour; and after
“ some time add a proper quantity of water, and wash the
“ colour in the same manner as has been directed for lake,
“ &c. and when properly washed, proceed in the same
“ manner to dry it in lumps of convenient size.”

By the proportions as given in this process, if it be rightly conducted, the Prussian blue produced will be both deep and bright; but where it is desired to be of a lighter colour, the quantity of dried blood must be lessened; for if it be even reduced to one half, a beautiful light blue may be made. The proportion of vitriol may, if only half the proportion of blood be used, be also reduced to half, and likewise the spirit of salt in proportion to that; the only use of such spirit being to re-dissolve the ochre or iron precipitated from the vitriol. But if any abatement be made in the quantity of vitriol, an equivalent weight of the alum must be substituted in its place, that there may be a sufficient proportion of one or other of these salts to precipitate the sulphur of the blood from the lixivium.

If the quantity of spirit of salt prescribed fail, however, to convert the precipitated matter from green to perfect blue, a greater proportion must be used; for though the quantity directed be fully sufficient when the spirit is of due strength, yet as it is frequently found weak when purchased of the chymists, or those who sell it, there can be no certain dependence laid on any rule, without observing that the effect be correspondent.

Prussian blue, when made in great quantities, may, for expedition, be dried by heat, and this may be performed by means of a small furnace, constructed in the following manner: let a horizontal funnel of brick-work be built, with a vent at one end, opening into a chimney. This funnel must be of such breadth as will admit its being covered by plates of tin, and its length must be regulated by the quantity of matter there may be occasion to dry.

The plates of tin should be well varnished over, as well on the under as upper side, by drying oil boiled to a thick consistence and black colour, and then rendered again fluid by means of oil of turpentine. They should be cemented to each other, where they join, by putty, mixed with the above varnish; but they may be fixed to the brick-work, which they rest upon by fire-lute and Dutch, and other tiles, laid over the edges. In the front of this funnel must be made a small fire-place for burning charcoal, which must vent itself into it instead of a chimney. The Prussian blue to be dried must be laid in the form of a cake upon these tin plates, and then scored across with a piece of horn both ways, by which means as the moisture exhales, and the mass shrinks, each square, formed by the scoring, will be a separate lump. Ochres, and all other earths, as also vermilion, may be dried in the same way on these plates: but as those substances have nothing gummy or adhesive in their texture, they may be laid on paper upon the plates, which will prevent their contracting any foulness from them.

The goodness of Prussian blue must be distinguished by its brightness, deepness, and coolness; and where these qualities are found together in any parcel, it may be depended upon that it will stand well; for whatever is added to it to sophisticate it, or whatever is done amiss in the process, will always render it more foul and purple. The most certain way to judge of it is therefore to try it with white lead, or flake white and oil, where the above qualities will display themselves, or appear wanting, in a much more distinguishable manner than in the lumps of the unmixed pigment. In the preparation of the coarser kind of common Prussian blue, a great part of the ochre or iron precipitated from the vitriol is left in the pigment; but in good Prussian blue there ought to be no iron, for in time it overpowers the blue of the sulphur of the coal, and shews its own proper tinge of yellow in the paint, as may be seen in all blue waincots, or other work done by house-painters; which in a short space of time turn to an olive or greenish grey colour. The presence of iron in Prussian blue may be discovered by boiling a small quantity of what is suspected in a lixivium of pearl-ashes, to make a separation of the colour from the remaining earth; which, if it

partake of the other, will appear yellow when washed and dried ; but if free from it, white or grey.

OF VERDITER.

VERDITER is the mixture of chalk and precipitated copper, which is formed by adding the due proportion of chalk to the solution of copper, made by the refiners in precipitating the silver from the *aqua fortis*, in the operation called parting, in which they have occasion to dissolve it, in order to its purification. Verditer is, when good, a cool full blue, but without the least transparency either in oil or water. It is of a moderate degree of brightness, and would have consequently a considerable value in the nicer paintings, where it would supply the place of ultramarine, or at least of the ultramarine ashes, if it could be depended upon. But in oil it is very subject to turn greenish, and sometimes black ; and in water, when it is safer, it is yet not always found to hold. For which reasons it is rejected, except in paper-hangings and other coarser work, or in varnish, where this objection to it ceases.

Verditer is only to be had at a cheap rate from the refiners, who are at no expence in the making it, but that of the chalk and labour, as they could find no other use for the solution of copper made by precipitating the silver from the *aqua fortis*, in one of their most common operations, were they not to apply it to this. The manner in which it may be best done by them is as follows.

“ Take any quantity of chalk, and having rendered it
 “ properly fine by washing over carefully, add it gradually to the solution of copper, so long as any change
 “ appears to be produced by it from the ebullition excited: or the due proportion may be perceived by the
 “ fluid’s losing its green tinge and becoming colourless.
 “ Let it then stand at rest till the sediment be subsided,
 “ and pour off the clear part of the fluid from the powder ; adding in its place clean water, which must be several times renewed till the salts be entirely washed out.
 “ The sediment, which is the verditer, must be afterwards
 “ freed from the fluid by filtering through paper covered
 “ with a cloth, and laid out in lumps of a middling size
 “ to dry.”

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The verditer as commonly sold requires no subsequent preparation for its being used; only where, as is frequently the case, from using such chalk in the making of it as is not purified, it is found gritty, and not sufficiently fine, and should then be freed from this grit or foulness by washing over.

Those who desire to make verditer themselves, may prepare the solutions of copper, by adding copper filings gradually to *aqua fortis* of any kind, or putting plates of copper into it, and then proceeding as is above directed for the refiners solution. It is not so expensive, when prepared in this manner, but that it will well answer to those who cannot conveniently procure that prepared by the refiners.

Verditer is not subject to be adulterated, as nothing cheaper of the same appearance can be mixed with it. Its goodness must be distinguished by the darkness and brightness of the colour: and that is likewise to be preferred which is of the fullest blue teint, and not inclining to green, as it may be inferred from thence that the colour will stand the better. A much deeper and brighter kind of verditer may be made, by using a filtered solution of pearl-ashes, in the place of the chalk, and proceeding, as to all other particulars, according to the above directions.

BLEU DE CENDERS, OR SANDERS BLUE.

This colour, or rather name, is of late introduction, and has taken its rise, in all probability, from some French painter's having taught the use of verditer in water colours under the name *cendre bleu*, which the French in common style give to it. This has been corrupted into sanders blue; and the late writers, who have pretended to teach the art of painting in water colours, &c. have, amongst other blunders and absurdities, spoken of this as a distinct colour from verditer, known and in common use. There is nothing, however, to be found, on the most diligent inquiry, in the colour-shops, under this name, but common verditer, or a species of it where the precipitation of the copper appears to be made in part upon starch, as well as chalk. But this by no means answers the description of the author of a pamphlet published by Mr. Peel in the year 1731, who says, "Sanders blue is of very good use, and

“ may serve as a shade for ultramarine or the blue bice,
 “ where the shades are not required to be extremely deep,
 “ and is of itself a pleasant blue to be laid between the
 “ lights and shades of such a flower as is of a mazarine
 “ blue.” By which it is plain the sanders blue meant
 here cannot be any kind of verditer, as that is always lighter
 than the ultramarine itself, and can therefore never be
 a shade to it: unless the species of verditer mentioned above
 has been prepared darker than at present, as is practicable,
 and sold under such a name, this author must have made
 some mistake, or imposed upon the public, by writing what
 occurred to his imagination without regard to fact.

If any, however, may desire to prepare a dark verditer,
 of the kind here spoken of, they may do it in the following
 manner.

“ Take of the refiners solution of copper made in the
 “ precipitation of silver from the spirit of nitre; or dissolve
 “ copper in spirit of nitre or *aqua fortis*, by throwing
 “ in filings, or putting in slips of copper gradually, till
 “ all effervescence cease. Add to it of starch, finely powdered,
 “ the proportion of one-fifth or sixth of the weight
 “ of the copper dissolved. Make then a solution of pearl-
 “ ashes; and filter it, and put gradually to the solution of
 “ copper, as much as will precipitate the whole of the cop-
 “ per, which may be known by the fluid’s becoming clear
 “ and colourless, though before highly tinged with green.
 “ Wash the powder, which will be precipitated, in the
 “ manner directed for lake, &c. and, when it is so well
 “ drained of water by means of a filter as to be of a proper
 “ consistence, grind the whole well together, and lay
 “ it out to dry.”

OF INDIGO.

INDIGO is a tinging matter extracted from certain plants
 by means of putrefaction, and a coagulation by the air.
 It is brought from the East and West Indies, and cannot,
 as far as is hitherto known, be prepared in these colder
 climates, on account of the tender nature of the plants
 which produce it. It was formerly almost the only blue
 colour used in painting, either with oil or water, except
 ultramarine, which, from its great price, could only be
 applied to very nice purposes. But, at present, the inven-

tion of Prussian blue, and the foulness of the indigo brought from the French or our own plantations, which is greatly inferior in brightness to that made in the Spanish West-Indies, which was formerly imported here, have almost banished the use of it as a paint except for paper-hangings, or such gross uses. Where the best Spanish indigo, nevertheless, can be procured, it is preferable for many purposes to Prussian blue, of the same degree of brightness, from its certainty of standing; but it is never found either of the first degree of brightness, nor so cool as to be fit for all the uses to which Prussian blue can be applied.

There is no other preparation necessary to the using indigo in painting, except a perfect levigation, to which, for nicer purposes, washing over may be added.

The goodness of indigo may be discerned by its darkness and brightness; and, as it is always apt to be purple, coolness gives a great additional merit to the best for the uses of painting.

OF SMALT.

SMALT is glass coloured with zaffer, and ground only to a very gross powder. Its texture does not permit it to be worked with either brush or pencil; but it is used for some purposes, by strewing it on any ground of oil-paint while wet; where it makes a bright warm blue shining surface, proper for large sun-dials, and other such applications.

It is prepared from fluxing zaffer with glass of salts; the proportion of which may be one-seventh part, or more or less, according to the degree of deepness required in the smalt. It is used almost in enamel painting, and in painting on glass, for which purposes it is of great use.

The goodness of smalt consists in its being dark, bright, and cool, though it always verges on the purple.

Besides the common kind of smalt, there is a very fine sort made in Saxony, but prohibited, under great penalties, from being carried out of the country; it has, however, been brought hither, and sold sometimes under the name of ultramarine, and at others under its own name. The price has always been high, but has varied from six guineas an ounce to fifteen shillings, in consequence of quantities procured by Jews in Saxony at a low rate, in

consequence of the Prussians seizing all the works of this kind during the late war. This sort of smalt is not made of zaffer, but of the finest calx of cobalt, free from the sand which enters into the composition of zaffer mixt with some proper flux. It is exceedingly strong of colour, and dark; and therefore serves for many purposes which ultramarine and common smalt cannot so well answer. It is much harder than the common smalt, and therefore requires some flux to be added. It may be distinguished from ultramarine, not only by its dark hue, but by the trial with fire above-mentioned, in the case of common smalt. For though it will not run perfectly without some flux, yet it will become a hard semivitrified mass, if urged with a strong heat, while the ultramarine, in the same degree of heat, will remain a powdery calx as before its being exposed to the action of the fire.

OF BICE.

BICE is smalt reduced to a fine powder by levigation. It is a light warm blue colour, and was formerly used in oil, more frequently in water colours; but from its unsuitable texture it is now greatly disused.

Its goodness lies in the brightness and coolness. This holds good only of the original and true bice; for at present several compositions of indigo and verditer, with chalk or other cheap substances, are sold in the name of bice.

OF LITMUS, OR LACMUS.

LITMUS is a blue pigment brought hither from abroad, and formed from archal, a species of moss, brought from the Canary and Cape de Verd islands, being in fact the same with that from which the purple tincture called archal, below treated of, is made. It is only used in miniature paintings, and cannot be there well depended upon, as the least approach of acid changes it instantly from blue to red; though it will stand if no such accident intervene.

Litmus is brought from Holland at a cheap rate, and will go so far in painting with water colours, the only kind of painting where it can be used, that it is needless to give

the preparation. But if any are desirous, for curiosity, to know the process, it is thus performed.

“ Add quick-lime and putrified urine, or spirit of urine distilled from lime, to the archal, previously bruised by grinding. This mixture must be suffered to stand till it acquire a very blue colour. After which the fluid must be suffered to evaporate, and the remaining mass, when it is of the consistence of a paste, must be laid on boards to dry in square lumps.”

The goodness of litmus may be judged of by the brightness and dulness of its colour. But the best is worth little for painting, as it is very apt to change and fly.

CLASS III.—OF YELLOW COLOURS.

OF KING'S YELLOW.

KING'S YELLOW is a pure orpiment, or arsenic coloured with sulphur. It is used for painting in oil with varnish, and is of an extreme bright colour, and, when good, a true yellow; it will likewise stand well, being used alone, but when mixed with white lead and several other pigments, its colour flies or changes. On this account, and for the additional reasons of its being esteemed a poison, and having a most nauseous smell, it is rejected by many. Others, nevertheless, find too much advantage in its great brightness, as well in the use of it as a yellow, as when mixed with blue pigments to form a green, not to have recourse to it on some occasions.

This pigment must be prepared by mixing sulphur and arsenic by sublimation, which may be done in the following manner.

“ Take of arsenic powdered and flowers of sulphur in the proportion of twenty of the first to one of the second; and having put them into a sublimer, sublime them in a sand-heat with such a furnace as is described p. 38, according to the general directions given p. 45. The operation being over, the King's yellow will be found in the upper part of the glass, which must be carefully separated from any *caput mortuum* or foul parts that may be found in the glass with it. It must be afterwards reduced to an equal powder by levigation.”

It may likewise be obtained from common orpiment, by subliming it, instead of the arsenic and sulphur, in the same manner; but the produce will be small in this method.

The King's yellow may be rendered warmer, that is, more inclined to orange, by increasing the proportion of the sulphur; or the contrary effect may be produced by diminishing it.

King's yellow cannot be adulterated without diminishing its brightness; and therefore that, which is best in this respect, may be esteemed good in others. Coolness, or the being free from red, is likewise a merit.

OF NAPLES YELLOW.

NAPLES YELLOW is a warm yellow pigment rather inclining to orange, but in a very minute degree. It is seldom used but in painting with oil, where it is generally found to stand well; but, if it touch iron along with the least watery moisture, it will be changed by it. As it is brighter than most yellows used in oil, and indeed than all at present in use, except the King's yellow, it is much received into practice. It has been supposed to be a native earth, and is said to be found in the neighbourhood of Naples; but this is dubious, as the different parcels of it vary too much from each in specific qualities to allow the supposition of their being native earths of the same kind, at least with respect to such as are to be obtained from our shops; for I have met with some that were of a very different composition from the common. The uncertainty with regard to the genuineness renders this pigment less valuable, as it is less to be depended upon with respect to its holding its colour. Whether, however, it is an earth that is at present generally sophisticated, or what the preparation of it is, we are at present ignorant, as it is brought from abroad. This makes it more difficult to give marks of its genuineness; which may therefore be best gathered from its appearance, and manner of mixing with the oil, in which the more adulterate kinds differ from the common.

Though Naples yellow is of a gritty texture, yet it is best to use it as it is obtained, and only grind it with the oil, for it does not well bear levigation with water. But if such levigation be nevertheless practised on it, the great-

great care must be taken to employ an ivory spatula in the place of a palette-knife, which would certainly injure the colour if it were touched with it while wet; and even when moistened with oil, the iron is in some degree injurious to it.

OF YELLOW OCHRE.

YELLOW OCHRE is a mineral earth, which is found in many places, but of different degrees of purity. When free from other earths and heterogeneous matter, it is a true yellow of moderate brightness; and, as its texture suits it for all kinds of painting, and that it will never fly in the least, it is a very valuable colour with respect to its utility, though of low price.

There is no other preparation of yellow ochre necessary than levigation, and for nicer purposes washing over, to undergo which its texture is extremely suitable.

The goodness of yellow ochre may be distinguished by the brightness and fulness of its yellow colour, and if it be bright it cannot be too cool. There are some kinds of yellow ochre which are very bright, and which being well prepared by washing are sold by some colourmen at a considerably greater price than the common. But these better kinds are counterfeited, and even the best sometimes set off to more advantage by mixing Dutch pink with the ochre. This imposition must be guarded against, which may be done by heating it to the degree that will turn paper brown, which, if it be genuine, will make little or no alteration in it; but if it be adulterated in this manner, will give an apparent foulness to it.

OF DUTCH PINK.

DUTCH PINK is a pigment formed of chalk, coloured with the tinging particles of French berries, or other vegetables. It is principally used for coarser purposes in water, not bearing well to be worked in oil, nor can it be depended upon with regard to its standing, so as to be fit for paintings of any consequence.

There are a variety of methods of preparing Dutch pink; but the following is very cheap and easy, and makes a most beautiful pigment.

“ Take of French berries one pound, and of turmeric-root powdered four ounces; boil them in a gallon of water two hours, and then strain of the tincture through flannel, and boil it again with an ounce of alum till it be evaporated to one quart. Prepare in the mean time four pounds of chalk by washing it over, and afterwards drying it, and mix the chalk with the tincture by grinding them together, and then lay out the Dutch pink thus made to Dry on boards.”

Dutch pink is sometimes prepared in the same manner with starch and white lead.

The goodness of Dutch pink consists in its being of a full gold coloured yellow, and very bright. It admits of no adulteration but what would appear by the diminution of the brightness, and therefore the eye can determine.

ENGLISH PINK.

ENGLISH PINK is only a lighter and coarser kind of Dutch pink, and may be prepared in the same manner, the quantity of chalk being increased in proportion, as it is intended to be inferior to the Dutch.

OF LIGHT PINK.

LIGHT PINK is of two kinds, the one the same with the Dutch pink, only with greatly less colour; the other the same with the brown pink, that is, transparent in oil, but with less colour.

The first kind, like the Dutch pink, is only fit for using in water, and there likewise only in paintings where the holding of the colour is not of great consequence.

The other is by some used in oil paintings, in the same manner as brown pink, its transparency making it have a good effect in shades for some purposes; but it is not a judicious practice, for all these colours formed of vegetables are very uncertain with respect to their standing, and the native earths, or prepared ochres, properly managed, will answer equally the same ends.

The preparation of the first kind of light pink may be in the same manner as that of the Dutch pink, only diminishing the proportion of the French berries and turmeric to one half.

The other kind of light pink may be prepared in the following manner.

“ Take of French berries one pound, boil them with a gallon of water for an hour; and, having strained off the fluid, add to it two pounds of pearl-ashes, dissolved and purified by filtering through paper. Precipitate with alum dissolved in water, by adding the solution gradually, so long as any ebullition shall appear to be raised in the mixture. When the sediment has thoroughly subsided, pour off the water from it, and wash it with several renewed quantities of water, proceeding as has been before directed in the case of lake, &c. Drain off the remaining fluid in a filter with a paper covered with a linen cloth; and, lastly, dry it on boards in small square pieces.”

Light pink may be likewise prepared from fustic wood, weld, and several other vegetable substances, which afford copiously a yellow tinge.

The goodness of light pink lies principally in its brightness and transparency; and, when designed for the shops, care should be taken that it do not fatten in the oil, which will happen if the salts be not thoroughly washed out of it.

GAMBOGE.

GAMBOGE is a gum brought from the East-Indies. It dissolves in water to a milky consistence, and is then a bright light yellow. It is used only in water, but there it is of great service, being the principal, or, indeed, almost the only yellow commonly employed.

Gamboge requires no preparation, but dissolves immediately on rubbing it, with the addition of water.

The goodness of gamboge may be distinguished by its appearance, while in the state of a gum, of a deep warm bright colour, and the more it approaches to transparency the better.

OF MASTICOT.

MASTICOT, is a pigment for painting, (for the wood is likewise used for a white glazing for earthen ware) is flake white, or white lead gently calcined, by which it is

changed to a yellow of lighter or deeper teint, according to the degree of calcination. It is not greatly used at present, the colour not being very bright; but as it will stand perfectly in oil and in water, as well as flake white, or white lead, it certainly might be used for many purposes, as it works with the pencil better than most other pigments.

It may be prepared by putting the flake white, or white lead, on an earthen or stone dish before a strong fire, and continuing it there till the colour be sufficiently yellow, each side of the plate being put next to the fire in its turn, that the whole of the masticot may be equally calcined. Otherwise the matter to be calcined may be put into a crucible, and the crucible placed in a moderate heat in a common fire; care being taken to remove it as soon as the masticot appears of a proper colour, which must be distinguished by taking a part of it out; for the colour does not shew itself properly while the matter is hot. The calcination being finished, the parts which are of the teint wanted must be picked out from the rest, and put together. For, with the greatest care, it is difficult to calcine the whole equally; and consequently to avoid rendering some parts of a deep yellow or orange.

There is no further preparation necessary for the using masticot either in oil or water painting, except the grinding it with the vehicle.

COMMON ORPIMENT.

COMMON ORPIMENT is a fossil body, composed of arsenic and sulphur, with a mixture frequently of lead, and sometimes other metals. It was formerly used as a yellow in painting, but at present is very seldom employed in its unrefined state, unless to colour the matted bottoms of chairs, or other such coarse work. When purified by subliming, it becomes the King's yellow, of which we have before spoken. It is of a pale greenish yellow colour, and might be useful for several purposes, if its nauseous smell, and supposedly poisonous quality, did not make the meddling with it disagreeable, particularly in oil, where its bad scent is greatly increased. The goodness of orpiment consists in the brightness and strength of its colour; and the warmer, or rather the less inclining to green, the better it is for the purposes of painting.

OF GALL STONES.

GALL STONES are concretions of earthy matter and bile formed in the gall bladder, or bile duct of beasts. It is used by those, who know the secret of its excellence, in water; with which being rubbed, and treated as gamboge, it becomes a deep warm yellow, that for its brightness and dark shade, when not too thin spread, as well as holding its colour, is very valuable.

As the gall stones are not always to be procured, a facitious kind may be prepared, which will greatly answer the same purpose. They may be made in this manner.

“ Take a quart of the bile of oxen, as fresh as possible; put it into a proper pewter vessel, and set it to boil in *balneo mariæ*, having added to it a quarter of an ounce of clear gum Arabic; evaporate the whole to about an eighth, and then remove it into a China cup or basin of proper size, and evaporate it to dryness, collecting it into a mass as it becomes of a stiff consistence.”

This may be used as the gall stones; and, being more transparent, will be found of very great advantage in water painting.

TERRA DI SIENNA UNBURNT.

TERRA DI SIENNA, as we have said before, speaking of it as a red when calcined, is a native ochrous earth, brought from Italy. In its uncalcined state it is a deepish warm yellow, and but slightly transparent either in oil or water. It is much less used uncalcined than calcined; but, nevertheless, as it is a deeper yellow by many degrees than any of the other ochres, and of a superior brightness, it might be used with advantage, as it will stand equally with the best.

When *terra di Sienna* is used uncalcined, it ought to be extremely well levigated and washed over; otherwise it is apt to lie heavy in the oil, which is probably the chief reason why it is so seldom used in an uncalcined state, though as much wanted for some purposes as the calcined for others.

TURPETH MINERAL.

TURPETH MINERAL is a preparation of mercury, by calcining it together with oil of vitriol. It is an excessive bright true yellow, of a great body like vermilion, and will stand equally well with that, and it works likewise with oil or water much in the same manner. These qualities render it very valuable for many purposes, as it is much brighter than any other yellow used in oil, except King's yellow, and is free from the nauseous smell of that pigment as well as cooler. This coolness, and its bearing to be mixed with Prussian blue, from whence a much finer green can be produced by it than from the King's yellow without ultramarine, give it, on the whole, greatly the preference. It has not, however, that I know of, been used in painting by any except those to whom I have recommended it; and who, on trial, have found it to answer to what I have here said of it.

The turpeth mineral may best be prepared in the following manner:

“ Take of pure quicksilver, and oil of vitriol, each six
 “ pounds. Put them into a retort, to which, being placed
 “ in the sand-bath, fit on a receiver, and distil them with
 “ a strong fire while any fumes appear to rise into the receiver, urging it at last with as great a heat as the furnace will bear. When the retort is again cold, remove
 “ it out of the sand-bath; and, having broken it, take
 “ the white mass, which will be found at the bottom of
 “ it, and break it to a gross powder; and, having put it
 “ in a glass mortar, pour water on it, which will immediately convert it to a yellow colour. Let it then be
 “ thoroughly ground in this mortar, with water, and afterwards washed with several successive quantities. It
 “ must then be thoroughly well levigated on a stone, and
 “ dried.”

The turpeth mineral may be had from the shops of any chymists or dealers in medicines; but it is not at present in those of colourmen. As it is now to be procured, it requires a previous levigation in water before it be used, being for the most part (though faultily) levigated for the uses of the medicine only in a very slight manner. The marks of goodness in the turpeth mineral are the bright-

ness of the colour, and its fulness or warmth; for as it never inclines more to the red than a true yellow, the less it verges on the green the better it consequently is for the purposes of painting.

OF THE YELLOW WASH FROM THE FRENCH BERRIES.

This is a solution of the gum of the French berries in water. It is used as a washing colour in water painting; and as it may be made of almost any degree of deepness, and is pretty bright, it is applicable to many material purposes, since nothing can be made of the gamboge but light tints. This colour will stand also extremely well, and being more diluted or laid on thicker, will, in consequence of its transparency, give a variety of shades.

The yellow berry wash may be thus prepared:

“Take a pound of the French berries, and put to them a gallon of water, with half an ounce of alum; boil them an hour in the pewter vessel described, p. 41, and then filter off the fluid through paper if it be designed for nicer purposes, or flannel for more ordinary. Put them again into the boiler, and evaporate the fluid till the colour appear of the strength desired; or part may be taken out while less strong, and the rest evaporated to a proper body.”

The goodness of the French berries may be distinguished by their appearing large, plump, and heavy: and if they have these qualities, the darker they appear the better; but unless they are large and plump, the darkness may only arise from their being gathered before they are duly ripe.

TURMERIC WASH.

The TURMERIC WASH is the gum of the turmeric root dissolved in water. The qualities and uses of it are much the same as the yellow berry wash, only it is a brighter and cooler yellow; but, in order to procure a bright tincture, it must be dissolved in spirit of wine instead of water. In order to which the following method may be pursued.

“Take two ounces of proof spirit, and add to it one ounce of water. Being put in a proper phial, add two drams of turmeric root in powder. Shake them well

“together, and then let them stand three or four days,
 “repeating the shaking as often as convenient, and a
 “strong tincture will be thus obtained.”

OF TINCTURE OF SAFFRON.

TINCTURE OF SAFFRON is used as a yellow wash with water colours. It is made by pouring hot water on the best English saffron in a proper phial or other vessel, which should be placed for some time in a heat next to that which would make the water boil, and the tincture should then be filtered from the dregs through a piece of linen cloth. The proportion of the saffron to the water must be regulated by the intention of having the colour deeper or paler. This tincture is a fine warm yellow, and, when very strong, makes a very proper shade for the gamboge or other light yellows that are bright; and it will stand equally well with any of the vegetable tinctures.

ZEDOARY WASH.

The ZEDOARY WASH may be prepared by boiling an ounce of zedoary root in a quart of water, till the water appear sufficiently tinged to make a stain on paper of a full yellow colour. The fluid must then be strained through linen to free it from dregs.

This wash will be much stronger of colour than can be made of turmeric without spirit of wine, and it is a cooler yellow than saffron, though full as bright. It is valuable for many purposes in painting with water colours, as flowers, yellow draperies, &c. It may be suffered to dry in shells, and will again dissolve and spread kindly with the addition of water.

CLASS IV.—OF GREEN COLOURS.

OF VERDIGRISE.

VERDIGRISE is a rust or corrosion of copper formed by the action of some vegetable acid, commonly that of the skin and pulp of grapes remaining after they have undergone a pressure for wine. It is brought from France

and Italy hither, and used in most kinds of painting where green is required. Verdigrise makes a blue green colour in paint; but is generally used in yellow, which, by a proper mixture, renders it a true green. It is bright, when good, but very soon flies when used in oil. When used in water painting, as it is dissolved previously in vinegar, which changes it to another substance, it is however rendered more durable.

It is needless to give any process for the making verdigrise, because it may be purchased much cheaper than it can be made in small quantities, and therefore only the proper object of a considerable manufacture. Such a manufactory is established lately in this country by Messieurs — and Maud, who have received two premiums, on that account, from the society for the encouragement of arts, &c. on the most satisfactory proof, that the verdigrise produced by them was even superior to the foreign, as well for the purposes of painting as any other uses.

There is no preparation of it necessary to the using verdigrise in oil or varnish, except a sufficient levigation; but in water painting, as is said before, it must be dissolved in vinegar; when in fact it ceases to be verdigrise, and is, instead of a corrosion, a salt of copper; the same with the crystals of verdigrise, we shall next treat of, only in a dissolved state.

Solution in vinegar is not, however, the only method by which verdigrise may be used in water painting, for it will dissolve in the juice of rue, and produces a fine full green colour equally fit for washing with that dissolved in vinegar.

The goodness of verdigrise may be distinguished by the fulness of its blue green colour, and inclining rather towards a crystalline texture than the form of a powder; to which must be added its being free from feculencies, and soluble in a considerable proportion in boiling water.

CRYSTALS OF VERDIGRISE, CALLED DISTILLED VERDIGRISE.

DISTILLED VERDIGRISE is the salt produced by the solution of copper, or common verdigrise, in vinegar. The crystals thus formed are of an extreme bright green colour, and in varnish, where they stand perfectly well,

they have a very fine effect. In oil they hold their colour well enough to answer many purposes, where colours are not required to be greatly durable; but in paintings of consequence they cannot be depended upon, being apt to turn black with time.

The crystals of verdigrise may be prepared in the following manner.

“ Take of the best verdigrise four ounces, and of distilled vinegar two quarts. The verdigrise being well pounded, let them be put into a circulating vessel, that may be formed of a matrafs, (which is a round bodied glass with a long strait neck) and a Florence flask, which must have its neck inverted into the matrafs, the thick end being broken off. This circulating vessel must be placed in a gentle sand heat, or other warm situation, where it must continue, being frequently shaken, till the vinegar has dissolved as much as it can of the verdigrise. Remove the verdigrise and vinegar then into a proper glass for decanting the fluid, when it shall become clear, from the sediment; and when it has stood a due time to settle, let it be carefully poured off and evaporated to about half a pint, which may be best done with a sand-heat, in a glass body or cucurbit, having its neck cut off to a wide mouth. It may be set to shoot in the same vessel, or in a glass receiver with a wide neck; and, when the crystals are formed, they must be taken out, and carefully dried in the shade.

“ A fresh proportion of vinegar may be added to the remains of the verdigrise, and at the same time the first quantity left undissolved; and the mothers, or fluid remaining after the crystals were formed, may be put into it; by which means, the other parts of the process being repeated, a second quantity of the crystals will be obtained.”

The distilled vinegar produces the most beautiful crystals of verdigrise; but common vinegar is more frequently used by those who prepare them, as it is much cheaper, and will afford very good coloured crystals, if care be taken in the evaporation not to suffer any part of it to burn to the glass; to avoid which accident, it is proper that the vessel wherein the evaporation is made should not be sunk deep in the sand, but only set upon it, or surrounded a little above the bottom.

The goodness of the distilled verdigrise may be perceived by the clearness of the crystals, and the bright green colour of them when powdered; for, being saline crystals, they do not admit of any sophistication, and can be only faulty through impurity.

OF SAP GREEN.

SAP GREEN is the concreted juice of the buckthorn-berries expressed from them.

It is a yellow green, and only used in water painting, where it is very useful for some purposes as a washing colour, making a strong and pretty bright stain. Sap green may be prepared in the following manner.

"Take any quantity of buckthorn-berries before they be ripe, and press out the juice in such a press as is used for making cyder or verjuice, or by any other method. Strain this juice through flannel, and then let it stand to settle; and, when it has stood a proper time, decant off the clearer part of the fluid from the sediment. Put this juice into a stone or earthen vessel, and evaporate it till it begins to throw of a thick consistence; then remove it into the pewter vessel described p. 41, and finish the evaporation in *balneo mariæ*, collecting the matter into one mass as it acquires a proper consistence."

The marks of goodness in sap green are the transparency, brightness, and strength of colour it appears to have when rubbed on paper.

PRUSSIAN GREEN.

PRUSSIAN GREEN is the same with the Prussian blue, except that, in the preparation, the precipitated ochre of the vitriol is suffered to remain with the precipitated earth of alum and the sulphur of the coal; the addition of the spirit of salt, by which, in the regular process for the Prussian blue, the ochre is re-dissolved, being omitted; whence, this ochre being yellow, a green is produced by it through the effect of the blue of the sulphur. The qualities of the Prussian green are much the same with those of the blue, except the difference of colour, and that it is not so transparent, nor, with regard to any I have hither-

to seen, so bright; neither can it be so well depended upon for standing as the Prussian blue when rightly prepared, tho' it is nearly equal in that point to the common. As the qualities are so much the same, the uses to which the Prussian green may be applied are much the same with those of the blue, excepting difference of hue; and at one time this colour was gaining ground among painters of some kinds; but it has since then been neglected, and at present seems almost wholly laid aside, though I am not sensible of the reason why this pigment might not be of advantage in many kinds of painting, as well as the common Prussian blue.

The manner of preparing this pigment may be as follows.

“ Proceed in all points as in the process given for the Prussian blue, till the solution of alum and vitriol be mixed with that of the pearl-ashes and sulphur of the coal, and the green precipitation made. Then, instead of adding the spirit of salt, omit any further mixture, and go on to wash the sediment, which is the Prussian green, and afterwards to dry it in the same manner as is directed for the blue.”

The goodness of the Prussian green consists in the deepness and brightness of the colour, and the more it is of a true teint of green, the better it is.

TERRA VERTE.

TERRA VERTE is a native earth, which in all probability is coloured by copper. It is of a blue green colour, much of that teint which is called *sea-green*. What we have in common here is not very bright, but being semi-transparent in oil, and of a strong body in water, and standing equally well with the best pigments, it is very much adapted to answer some purposes in both kinds of painting, though it is not so generally used by those to whom it would be serviceable as it merits. Mr. d'Acoſta ſays, in his book of fossils, that there is a kind which is very bright, and is found in Hungary; if it could be procured here, it would certainly be a very valuable acquisition to oil painting, as the greens we are forced at present to compound from blue and yellow are seldom secure from flying or changing.

Terra verte, as brought from abroad, is of a very coarse texture, and requires to be well levigated and washed over; but no other preparation is necessarily previous to its use. The only method of distinguishing its goodness is by the brightness and strength of its colour.

CLASS V.—OF ORANGE COLOURS.

THERE is not any simple pigment, prepared commonly, which can properly come into this class, the effect of orange being produced in practice by the mixture of red and yellow: but the following preparation being of my own invention, and serviceable to some who have already made a considerable use of it, I thought it proper to insert it for the benefit of others who may want such a pigment.

OF ORANGE LAKE.

This ORANGE LAKE is the tinging part of annatto precipitated together with earth of alum. It is of a very bright orange colour, and would work well with either oil or water; but cannot be depended upon, when used either of those ways, for standing long. It is, however, a very fine colour for varnish painting, where the fear of flying is out of question; and is also of an admirable good effect for putting under crystal for the imitation of the vinegar garnet, for which purpose it has been used with great success.

The manner of the preparation of the orange lake may be as follows.

“ Take of the best annatto four ounces, and of pearl-ashes one pound; put them together into a gallon of water, and boil them half an hour, and then strain the solution through paper. Make, in the mean time, a solution of a pound and a half of alum in another gallon of water, and mix it gradually with the solution of the pearl-ashes and annatto, observing to cease any further addition when the fluid becomes colourless, and no further ebullition ensues on the commixture. Treat the sediment or precipitated matter then in the same manner as has been before directed for other kinds of lake,

“ only this need not be formed into drops, but may be
 “ dried in square bits, or round lozenges.”

CLASS VI.—OF PURPLE COLOURS.

OF THE TRUE INDIAN RED.

THE TRUE INDIAN RED is a native ochreous earth of a purple colour ; and before the cheapness of the factitious kind occasioned it to be rejected by the colourmen, and consequently disused by painters, was constantly brought from the East-Indies, and sold in the shops. At present it is very rarely to be found ; but when it can be met with, it is certainly very valuable (there being no other uncompounded purple colour in use with oil) as well for the force of its effect as for the certainty of its standing. But the common kind, now fallaciously called by its name, has been, by degrees, from accommodating it to the purposes of house-painters, made to vary from it, till it is become entirely a different colour, being a broken orange instead of a purple.

The true Indian red, when it can be procured, needs no other preparation than grinding or washing over. It may easily be distinguished from any factitious kind by its being more bright than any other ochre which can be made so purple ; and if it be rendered artificially purple by any addition, the fire will soon betray it, into which the genuine may be put without any hazard of change.

OF ARCHAL, OR ORCHAL.

ARCHAL is a purple tincture procured from a kind of moss, bearing the same name, by solution in spirit of urine distilled with lime. It may be made in small quantities by those who cannot procure it of the manufacturers by this easy process.

“ Taken an ounce of the archal weed or moss, as it is
 “ sold at the dry salters, and having bruised it well, put
 “ it into a glass phial with half a pint of weak spirit of
 “ sal ammoniacus distilled with lime. Stop the phial
 “ close, and leave the archal to infuse till a strong bluish
 “ purple tincture be formed.”

It is an extreme bright purple fluid, and would be a beautiful wash if it could be depended upon; but it is apt to dry to a reddish brown colour, and therefore at present much disused in painting, though it had formerly a place in the common set of water colours. It is used in great quantities for some purposes of dying, and prepared by people who make it their business, and may be had cheap of them, or the dry-salters; but it is scarcely worth the trouble of procuring for the ends of painting.

OF THE LOGWOOD WASH.

Logwood is brought from America, and affords a strong purple tincture in water, which will stain of a bluish purple colour almost any body whatever capable of receiving such a tinge. It is used frequently in miniature painting to make a purple wash, which is varied to a more red or blue colour by the addition or omission of Brasil wood. This wash may be prepared in the following manner.

“Take an ounce of ground logwood, and boil it in a pint of water till one half of the fluid be wasted. Strain it then through flannel while of a boiling heat, and add to it, when strained, about ten grains of pearl-ashes, or about the bulk of a small French bean. If it be desired to be a more red purple, about half an ounce of Brasil wood may be added to the logwood, or in proportion as the colour wanted may require; and in this case the pearl ashes must be used very sparingly, or not added at all, unless the tincture appear too red.”

CLASS VII.—OF BROWN COLOURS.

OF BROWN PINK.

BROWN PINK is the tinging part of some vegetable of a yellow or orange colour, precipitated upon the earth of alum, cuttle-fish-bone, or some such-like calcareous substance. It is, when good, a concentrate yellow, which, as a pigment, is transparent in oil, gives the effect of a dark colour, and serves for deep shades. It is sometimes prepared of a warmer, and sometimes of a cooler

teint; and as each sort suits the purposes of particular kinds of painters, each kind is preferred by some, according to their wants. Brown pink would be of great value in painting, if it could be depended upon with regard to its standing; and it was formerly, when all the colours of this kind were more honestly and judiciously prepared, in almost general use in this part of the world. But at present it is difficult to find any that does not fly, or has not some other bad quality, particularly that of fattening to an excessive degree; and therefore it is much disused, and will probably, in a short time, be entirely exploded from practice.

There are many methods of preparing brown pink, as there are a great variety of vegetables which afford a yellow tinge very copiously, and which, treated in the same manner as is practised for making lakes, will afford such a pigment; but the most common, and one of the best methods, is as follows.

“ Take of the French berries one pound, of fustic wood
 “ in chips half a pound, and of pearl-ashes one pound.
 “ Boil them in the tin boiler, with a gallon and a half of
 “ water, for an hour, and then strain off the tincture
 “ through flannel while the fluid is boiling hot. Having
 “ prepared in the mean time a solution of a pound and a
 “ half of alum, put it gradually to the tincture so long
 “ as an ebullition shall appear. Proceed then to wash the
 “ sediment as in the manner directed for the lakes; and,
 “ being brought by filtering through paper with a linen
 “ cloth to a proper consistence, dry it on boards in square
 “ pieces.”

Brown pink may be made of the cuttle-fish bone dissolved in *aqua fortis*, in the manner described, p. 63, for lake; and in that case the precipitation may be made with this solution instead of the solution of alum, by adding it to the tincture so long as it appears to make any ebullition on the mixture. The solutions of the alum and cuttle-fish bones may be otherwise mixt together, and used for the same end, which will be found much better than that of the cuttle-fish bone alone. For though the common opinion is, that lake or brown pink will stand better, when the basis is cuttle-fish bone, than when it is earth of alum, yet the earth of alum is necessary for attracting and bearing down with it the tinging matter; which, especi-

ally that of the French berries, is apt to remain dissolved in the fluid, and to be carried off with it in washing the brown pink.

Brown pink is also made without the use of salts in the following manner :

“ Take two pounds of the berries, and boil them in a gallon of water for two hours, and then strain of the mixture carefully through flannel. Prepare in the meantime a pound and a half of cuttle-fish bone, by separating the soft inner part which is capable of being reduced to powder, from the hard exterior part, that must be thrown away, and levigating it well with water on a marble. Add then the cuttle-fish bone to the tincture, and evaporate them in *balneo marie* till the matter becomes of a stiff consistence ; when the whole being well mixt by grinding, it may be laid on boards to dry.”

The goodness of brown pink must be judged by its transparency and force of colour when mixed with oil ; but its qualities of standing well, and not fattening in oil, which are both defects that frequently attend it, can only be ascertained by trial and experience.

OF BISTRE.

BISTRE is the burnt oil extracted from the foot of wood. It is a brown transparent colour, having much the same effect in water painting, where alone it is used, as brown pink in oil. Though this colour is extremely serviceable in water colours, and much valued by those who know and can procure it, yet it is not in general use here, on account, I imagine, of its being not easily had of a perfect kind ; for I have never heard of any that was good, except what has been brought from France. Perhaps the principal reason for this is, that dry beech wood affords the best foot for making it ; and it is not easy to procure such here without mixture of the foot of green wood, or other combustibles that deprave it for this purpose ; or, it is possible, that they who have pretended to prepare it have been ignorant of the proper means, there not being any recipe or directions in books that treat of these matters, from whence they could learn them.

Bistre may, however, be prepared with great ease in the following manner :

“ Take any quantity of foot of dry wood, but let it be
 “ of beech wherever that can be procured ; put it into
 “ water in the proportion of two pounds to a gallon, and
 “ boil them half an hour. Then, after the fluid has stood
 “ some little time to settle, but while yet hot, pour off
 “ the clearer part from the earthy sediment at the bottom ;
 “ and if on standing longer it form another earthy sedi-
 “ ment, repeat the same method ; but this should be done
 “ only while the fluid remains hot. Evaporate then the
 “ fluid to dryness, and what remains will be good bistre,
 “ if the foot was of a proper kind.”

The goodness of bistre may be perceived by its warm deep brown colour, and transparency when moistened with water.

OF BROWN OCHRE.

BROWN OCHRE is a fossil earth, the same with the other ochres, except with regard to purity and the teint of its colour, which depends on calcination, either by subterranean fires or artificially. It is of a warm brown or foul orange colour ; and, as it can be absolutely depended upon for standing, it is valued by some in nicer kinds of painting, but most used, being of very low price, for coarser purposes.

When brown ochre is used for more delicate kinds of painting, it ought to be well levigated after it comes out of the hands of the colourmen, if had of them in a gross state in which it is commonly sold. But whoever would have it in the most perfect condition, must wash it over, which treatment should indeed be bestowed on all pigments of an earthy texture.

COLOGN, OR COLLEN'S EARTH.

COLOGN EARTH is a fossil substance. It is of a dark blackish brown colour, a little inclining towards purple. The principle use of it in painting is as a water colour, and its greatest effect is in the fore-grounds of pictures, where great force is required. It is not, however, at present much used even as a water colour, and more rarely in

oil, as there the same teint can be easily formed of blue, black, and any of the ochrous reds, which are pigments absolutely safe with respect to standing.

The goodness of Cologn earth must be judged of by the strength of the colour, and the suitableness of the teint to the purposes for which it is used. It requires no other preparation than to be ground perfectly fine with water.

TERRA JAPONICA, OR JAPAN EARTH.

TERRA JAPONICA is a gummous substance extracted from some kind of vegetable. It dissolves to a great degree in water, and is of a full brown colour, a little inclining to red. It is sometimes used in water painting; and as it is there a washing colour, may have a very good effect in many cases. In oil, its gummy texture renders its use improper, as it does not admit of its mixing kindly with that vehicle.

The goodness of *terra Japonica* may be distinguished by the clearness of its colour, and its appearing free from heterogeneous matter or impurities.

It requires no preparation, but it is dissolved in water, and freed from any feculencies.

OF UMBRE.

UMBRE is an ochrous earth of a brown colour. It was formerly used in most kinds of painting, but is at present neglected, except by some in water colour. It is valuable on account of its property of standing well, which it has in common with most other native earths, and it is supposed to have a more drying quality than other ochres, which has occasioned it to be much used in the making drying oils, the japanners' gold size, and the black oil lacker.

The umbre is frequently burnt previous to its being used, which renders it more easy to be levigated; but it gives it at the same time a redder hue. Whether it be used in a burnt or unburnt state, it is necessary, however, to wash it over when it is used in miniature painting, or for any nicer purposes, and that is all the preparation it requires.

OF ASPHALTUM.

ASPHALTUM is a bituminous matter of a consistence like tar, found in the earth in some parts of Asia, and probably elsewhere. It has a warm brown colour, and retaining in some degree its transparency when dry, it answers the end of brown pink in oil painting, with the additional advantage of being secure from flying. It is not in general use, nor probably easily to be procured pure; but it is certainly useful, when to be obtained good. The only objection I have ever heard to it is, that it turns sometimes blackish; but I never saw an instance of that, though I have known it used by several; and believe that appearance is not owing to any change in its colour, but to that density of its substance which it contracts in drying, and which should be allowed for in the application of it.

There is no preparation necessary to asphaltum previous to its use, but it ought to be carefully preserved in a proper phial with a wide neck, otherwise it is subject to dry, and become too thick for the purposes of painting.

Asphaltum is very liable to be adulterated by the mixture of turpentine, pitch, and other cheap substances of a balsamic consistence, with it; and it is not easy to distinguish the fraud, but by the appearance. When the asphaltum is good, it ought to be perfectly transparent, but of a warm deep brown colour.

OF THE SPANISH JUICE, OR THE EXTRACT OF LIQUORICE.

The SPANISH JUICE is the succulent part of the liquorice-root, extracted by decoction in water, and then strained off from the woody or undissolvable part of the root, and evaporated to dryness. It is sometimes prepared in this country, but mostly brought from abroad and is now much used as a brown colour in miniature painting, from its requiring no trouble to procure it, or render it fit for immediate use, and from the scarcity of good bistre. The latter, nevertheless, when it is to be had, is greatly preferable to the Spanish juice, as well on account of the clearness of its colour, as from its being free from that

viscid or sticky quality which attends the other on the least moisture.

CLASS VIII.—OF WHITE COLOURS.

OF WHITE FLAKE.

WHITE FLAKE is lead corroded by means of the pressing of the grape, and consequently, in fact, a ceruse prepared by the acid of grapes. It is brought here from Italy, and far surpasses, both with regard to the purity of its whiteness, and the certainty of its standing, all the ceruse or white lead made here in common. It is used in oil and varnish painting for all purposes where a very clean white is required; but no kind of ceruse ought to be used in water colours for paintings that are intended to endure time, as it will generally turn black, and appear at length as if the lead itself had been used instead of any preparation of it.

White flake is usually had of the colourmen in a prepared state, under the name of *flake white*, being levigated and mixed up with starch, and most frequently with white lead, or much worse sophistications. Whoever, therefore, would be certain of using this pigment pure, should procure the white flake in lump as it is brought over, and levigate it themselves, washing it over also; and, if it be necessary, in order to the making it work more freely, they may grind it up afterwards with starch in the proportion they shall find on trial most suitable to their purpose.

The test of goodness in white flake is the degree of whiteness, which must be distinguished by comparing it with a specimen of any other parcel, after it has been rendered of due fineness; but where it is suspected to be adulterated with any other mixture than that of white lead, the sophistication and proportion of the spurious matter may be ascertained by the same means as are below advised to be used for the examination of white lead.

OF WHITE LEAD.

WHITE LEAD, OR CERUSE, is the corrosion or rust of lead formed by means of vinegar.

It is made in our own country, and is much cheaper than white flake, but inferior in whiteness, and the other qualities which render this pigment advantageous in painting. It is, however, the white employed for all common purposes in oil painting, and also the body or solid basis of the paint in many mixt colours, where the teint is of a lighter nature, or the coloured pigments will bear diluting with white.

It is made by dipping or brushing plates of lead in vinegar, or any other cheap acid, and putting them in a cellar or any cool damp place; but as this is carried on as a large manufacture by those who are concerned in it, and who can consequently afford it at a much lower rate than any can prepare it for their own use, it is unnecessary to enter on a further detail with respect to the manner.

There is no previous preparation necessary in the case of white lead to its use, except washing over where it is intended for more delicate purposes; but then indeed it is always best to substitute the flake white.

Notwithstanding the low price of white lead, yet, being consumed in great quantities, it is for the most part adulterated by the manufacturers of, or wholesale dealers in it. The common sophistication is with chalk or powdered talc, as being the cheapest ingredients with which it can be mixt without changing too much its appearance. This in a lesser degree is of no great moment, as they only diminish the quantity of body or covering matter in the paint; but when in a greater proportion, they not only produce a great loss, by rendering a larger quantity necessary to do the same work, but deprave the paint highly with respect to its other qualities.

The adulteration of white lead may be most easily examined by comparing a piece of any that is suspected with another piece, known to be pure, of equal bulk, and the difference of weight will shew the fraud where the heterogeneous matter is in great proportion, as it will necessarily be of a much lighter nature than lead. But where the quantity of the adulterating matter is less, or the proportion of it would be more exactly known, the following method shou'd be used.

“ Take an ounce of the white lead suspected, and mix
“ it well with about half an ounce of pearl-ashes, or of
“ any fixt alkaline salt, and about a quarter of an ounce

“ of charcoal-duft, and, having put them into a crucible”
 “ give them a ftrong heat. The lead will by this means
 “ be reduced to its metallic ftate, and, being weighed,
 “ will fhew by what it may fall fhort of the weight of an
 “ ounce, the proportion of the adulteration, about a tenth
 “ part being allowed for the corroding acid which formed
 “ part of the white lead.”

OF CALCINED, OR BURNT HARTSHORN.

CALCINED HARTSHORN is the earth which makes the basis of horn, or indeed all other animal fubftances, rendered pure by the action of fire, which feparate from it all faline and fuphureous fubftances. It is of the firft degree of whitenefs, and not fubject to be changed by the air or time, and is, on account of thefe qualities, almoft the only white now ufed in water painting for nicer purpofes, white lead or flake, from the objection before mentioned with refpect to their turning black, being greatly difufed by the more experienced painters.

It is not neceffary that this earth fhould be produced from the horn of ftags, or any other horn, for indeed any other animal fubftance of the more folid kind, will equally well produce it. The common manner of preparation of this matter is, to calcine, in an open furnace, the coal of the horn remaining after the diftillation of the fpirit of hartfhorn. But what is fold for calcined hartfhorn at prefent is more frequently the earth of bones, and if there be no further fophiftication practifed, this fubftitution is not in the leaft detrimental. It is, however, I am afraid, too ufual to mix chalk or lime with the animal earth, which by their alkaline power change the colour of the vegetable pigments, and frufterate often the labour of the painter, without his being able to guefs at the caufe of his mifcarriage. Whoever is defirous to prevent this inconvenience, and to have the burnt hartfhorn perfectly pure, may prepare it eafily themfelves in the following manner.

“ Take horn or bones, and burn them in any common
 “ fire till they become a coal, or are calcined to fome degree of whitenefs. Then, having freed them carefully
 “ from any other coal or filth, reduce them to a grofs
 “ powder, and put them upon a veffel made in form of a
 “ common earthen difh of ground crucibles and Stur-

“ bridge clay well dried, and procure this to be placed
 “ in a tobaccopipe-maker's, or potter's furnace, during
 “ the time they keep their pipes or pots in the fire. The
 “ earth of the horn or bones being thus thoroughly cal-
 “ cined, it must be very well levigated with water, and
 “ it will be yet further improved by being carefully wash-
 “ ed over.”

The perfection of calcined hartshorn lies in its whiteness and fineness, which may be distinguished by the sight and touch, and in purity also, which is not so easily discovered. It may be known, nevertheless, by the pouring oil of vitriol upon any suspected quantity, which will not produce any ebullition with pure calcined horn or bones; but will immediately excite an apparent fermentation with lime or chalk, the common matter with which they are adulterated, if any be mixt with them.

OF PEARL WHITE.

PEARL WHITE is the powder of pearls, or the finer parts of oyster-shells; but I suppose the former has rarely been used, on account of the dearth of the pearls; which are, moreover, not in the least better for this purpose than the oyster-shells properly managed.

This white is used in miniature paintings, and agrees much better with the vegetable colours than flake, white lead, or Troy white.

The method of preparing the pearl white is to take the oysters as they are found on the sea-coast calcined by the sun, or otherwise to dry fresh ones by the fire till they will powder easily, avoiding, however, carefully such heat as may in the least burn them, or change their colour; then scrape off from these shells all outward or other parts that may not be of the most perfect whiteness, and levigate them well with water on the stone, and wash the powder over till thoroughly fine.

OF TROY WHITE, OR SPANISH WHITE.

The TROY WHITE, OR SPANISH WHITE, is chalk neutralized by the addition of water in which alum is dissolved, and afterwards washed over.

It is used by some in water colours as a white, and may be thus prepared :

“ Take a pound of chalk and soak it well in water.
 “ Then wash over all the fine part, and, having poured
 “ off the first water, add another quantity, in which two
 “ ounces of alum is dissolved. Let them stand for a day
 “ or two, stirring the chalk once in six or eight hours.
 “ Wash then the chalk again over, till it be rendered
 “ perfectly fine, and pour off as much of the water as can
 “ be separated from the chalk by that means, taking off
 “ the remainder of the dissolved alum by several renewed
 “ quantities of fresh water. After the last water is pour-
 “ ed off, put the chalk into one of the colander filters,
 “ with a linen cloth over the paper, and when the mois-
 “ ture has been sufficiently drained off from it, lay it out
 “ in lumps to dry on a proper board.”

OF EGG-SHELL WHITE.

EGG-SHELL WHITE is used by some in water colours, and preferred to flake, or the Troy white. It may be thus prepared :

“ Take egg-shells and peel off the inner skins. Then
 “ levigate the shell to a proper fineness, and wash over
 “ the powder.”

CLASS IX.—OF BLACK COLOURS.

OF LAMP BLACK.

LAMP BLACK is the foot of oil collected as it is formed by burning. It is a brownish black; but, nevertheless, being of a good texture for mixing either with oil or water, and drying well with oil, it is the principal black at present used in all nicer kinds of painting; for notwithstanding ivory black far surpasses this in colour, the gross and adulterate preparation of all that is now to be obtained has occasioned it to be greatly rejected.

The lamp black is made by burning oil in a number of large lamps in a confined place, from whence no part of the fume can escape, and where the foot formed by these fumes, being collected against the top and sides of the room, may be swept together and collected, and this being

put into small barrels is sold for use without any other preparation.

The goodness of lamp black lies in the fulness of the colour, and the being free from dust or other impurities. The lightness of the substance furnishes the means of discovering any adulteration, if to a great degree, as the bodies with which lamp black is subject to be sophisticated are all heavier in a considerable proportion.

OF IVORY BLACK.

IVORY BLACK is the coal of ivory or bone formed by giving them a great heat, all access of air to them being excluded. It is, when pure, and genuinely prepared from the ivory, a full clear black, and would be the most useful of any in every kind of painting, but that it is apt to dry somewhat too slowly in oil. At present, nevertheless, it is prepared only by those who manufacture it from bones in very large quantities for coarse uses, and sell it at an extreme low price. It is therefore so grossly levigated, being ground only in hand or horse-mills, and so adulterated moreover with charcoal-dust, which renders it of a blue cast, that it is wholly exploded from all more delicate purpose, and lamp black used in the place of it, though inferior, with regard to the purity and clearness of the black colour, to this when good.

As the ivory black, notwithstanding, has its merit in most kinds of painting, when its preparation is properly managed, (particularly in water and varnish) those who desire to have it may prepare it themselves in perfection by the following means:

“ Take plates, chips, or shavings of ivory, and soak
 “ them in hot linseed oil, or if filings are to be more easily procured, they may be used moistened with the hot
 “ oil. Put them into a vessel which will bear the fire,
 “ covering them with a sort of lid made of clay and sand,
 “ which should be dried, and the cracks repaired before
 “ the vessel be put into the fire. Procure this vessel to
 “ be placed in a tobaccony-maker's or potter's furnace,
 “ or any other such fire, and let it remain there during one
 “ of their heats. When it shall be taken out, the ivory
 “ will be burnt properly, and must be afterwards thoroughly well levigated on the stone with water; or it

"should indeed, to have it perfectly good, be also washed over."

Those who have a calcining furnace, such as is described p. 39, may very commodiously burn the ivory in it, and the fire need not be continued longer than while the fumes that arise from the vessel containing the ivory appear to flame. This operation may likewise be performed in the subliming furnace, described p. 35, by putting the ivory in a retort coated with the fire-lute, and fixing the retort as is directed, p. 45, for the sublimers; and a proper receiver being fitted to the retort, the fumes will be detained in it, and the smell prevented from being in the least troublesome; the fire must in this case be continued while any gross fumes come over.

The goodness of ivory black may be perceived by its full black colour, not inclining too much to blue, and by its fineness as a powder.

OF BLUE BLACK.

BLUE BLACK is the coal of some kind of wood, or other vegetable matter, burnt in a close heat where the air can have no access. The best kind is said to be made of vine-stalks and tendrils; but there are doubtless many other kinds of vegetable substances from which it may be equally well prepared. It is, when good, a fine bluish black colour, useful in most kinds of paintings for many purposes; but is rarely to be had at present well prepared, and therefore much neglected in most nicer cases.

Those who desire to have blue black perfectly good, may prepare it in the manner above directed for the ivory black, from the vine-stalks or tendrils, or any other twigs of wood of an acid taste or tough texture, but the soaking in oil, prescribed for the ivory, must be here omitted.

The goodness of the blue black consists in the cleanness and blue cast of its black colour, and the perfectness of its levigation, which should be managed as directed for the ivory black.

OF INDIAN INK.

INDIAN INK is a black pigment brought hither from China, which, on being rubbed with water, dissolves and

forms a substance resembling ink, but of a consistence extremely well adapted to the working with a pencil. On this account, it is not only much used as a black colour in miniature painting, but is the black now generally made use of for all smaller drawings in *chiaro oscuro*, or where the effect is to be produced from light and shade only.

The preparation of Indian ink, as well as of the other compositions used by the Chinese as paints, is not hitherto revealed on any good authority; but it appears clearly from experiments to be the coal of fish bones, or some other animal or vegetable substance, mixed with isinglass size, or other size, and, most probably, honey or sugar-candy to prevent its cracking. A substance, therefore, much of the same nature, and applicable to the same purposes, may be formed in the following manner:

“ Take of isinglass six ounces, reduce it to a size, by dissolving it over the fire in double its weight of water.
 “ Take then of Spanish liquorice one ounce, and dissolve it also in double its weight of water, and grind up with it an ounce of ivory black, prepared as above directed
 “ in p. 112. Add this mixture to the size while hot, and stir the whole together till all the ingredients be thoroughly incorporated; then evaporate away the water in *balneo marie*, and cast the remaining composition into leaded moulds greased, or make it up in any other form.”

The colour of this composition will be equally good with that of the Indian ink; the isinglass size, mixt with the colours, works with the pencil equally well with the Indian ink; and the Spanish liquorice will both render it easily dissolvable on the rubbing with water, to which the isinglass alone is somewhat reluctant, and also prevent its cracking and peeling off from the ground on which it is laid.

CHAP. III.

Of the Vehicles, Dryers, and other Substances
used in Painting, for the laying on and
binding the Colours.

 SECT. I.

Of the Vehicles, Dryers, &c. in general.

THE qualities necessary in all vehicles (except in the case of crayons and enamel painting) are, that they should be of a proper degree of fluidity to spread the colour,—that they should be of such a nature, with respect to their attractive disposition, as fits them to combine well with the coloured pigments,—that they should become dry within a due time,—and that they should be capable of leaving a proper tenacious body, when they are become dry, as well to bind the colours to the ground, as to make them adhere to each other where more than one kind is used. But the combination of all these necessary qualities being to be found in no one substance, (except oil in some cases) compositions have been formed to suit the several intentions in a manner accommodated to each particular occasion.

The principal vehicles hitherto used are oils,—water,—spirit of wine,—and turpentine. But, as water and spirit of wine alone, want the proper unctuous consistence for spreading the colours, and dry away totally, without leaving any glutinous substance to bind and fix such of the pigments as are of an earthy or incohering texture, gums,—size,—sugar,—and other such viscid substances have been superadded to supply the defects, and render them of due consistence and body.

Though oils, simply used, are a perfect vehicle of colours in some cases, yet in many others, having been found to dry too slowly, means have been sought after, by the

addition of other bodies, to alter this quality in such as may be defective in it, which has consequently introduced another kind of substances into the *materia pictoria*. These substances, from their being employed in the intention of remedying this fault in the oils of not drying sufficiently fast, are called DRYERS. These are either ingredients of a different nature added to the oils, without any preparation of them; or part of the oils themselves, into which this quality has been introduced by the operation of heat, either in their simple state, or with the addition of the other drying ingredients. The oil, thus changed, being thence rendered capable, on its commixture with other oils, to cause them to dry faster, is called *drying oil*, and frequently used in the same intention as other dryers.

As water in its simple state is for the most part incapable of being a vehicle to colours, they being in general of an earthy or incohering texture, it is necessary to give it a more viscid consistence, and to join to it a body which will dry with such a tenacity as may bind the colours.

There is, however, one exception to this, which is the kind of painting, called *painting in fresco*. In the performing of which, the colours are used in water without any addition.

Where water requires to be inspissated, it is done by adding gums, size, sugar, or such other bodies as to tend to inspissate and impart to the water a more clammy and thick consistence. But where the colours themselves are bodies of a gummous nature, and will dissolve or grow viscid in water, as gamboge, the juice of the buckthorn berries, or the French yellow berries, and such others, further admixture in the intention of a vehicle is needless, and tends only to weaken the effects, or foul the colours.

The most usual addition where water is used in nicer paintings, is the transparent gums, such as the gum Arabic and Senegal. The principal reason of their preference to other bodies, which render water viscid and glutinous, lies in their suffering the mixture made of them with the colours to be instantly reduced to a working state, by the addition of fresh water at any time, though the quantity originally used be entirely dried. The consequence of which property in the substances employed to inspissate the water, colours so prepared, may be kept in a condition ready for use in shells, or other proper vessels, to any

length of time; but the gums have, nevertheless, a very untoward quality when mixed with most kinds of pigments, which is their being very liable to crack and peel off from the paper and vellum on which they are laid. To remedy this, therefore, sugar-candy, or what is better, though seldom used, honey is frequently added to them; and, by some, starch, boiled flour, and other bodies of a like nature.

The painting in this kind of vehicle is called *painting in water colours*, and from its being of late mostly confined to small objects, *miniature painting*; though it was till the introduction of the use of oils, which is modern, the only common method of painting in any way, since the encaustic and other methods of the ancients have been discontinued.

For grosser paintings and purposes, water is rendered a proper vehicle by the admixture of size, which is free from that disadvantage of cracking and peeling which attends the use of the gums. But then, on the other hand, it is unfit for nicer purposes where only a small quantity of each kind of colour is required. For as the composition of the vehicle and colours do, in such case, soon become dry, and those mixt with size, when once dry, will not again commix with water, by rubbing with a brush or pencil, as those compounded with the gums, it would be endless to employ size for such purposes, as all the kinds of colours must be fresh ground up and prepared every time there may be occasion to use them. The painting with size is therefore employed principally for scenes, and such large works, where it is now called *painting in distemper*.

There are likewise particular cases where other fluid substances may be employed advantageously along with the vehicles formed by water; as in the case of verdigrise, where water failing to dissolve it, vinegar, or juice of rue, as was before mentioned, should be substituted in its place. But they are in fact only natural compounds of water, and of the substance as may be wanted to make the pigment dissolve in, or commix with it.

Spirit of wine, as a vehicle for colours, is likewise insufficient in the end, without being compounded with other substances, as it wants a proper thickness or viscosity, either to suspend the pigments, or to bind and fix them to

the ground when dry. It is therefore found necessary to dissolve in it such gummous or resinous bodies as seed or shell-lac, mastic, sandarac, or resin; which answer the same purpose here as gum Arabic in water. A vehicle, however, formed from this mixture, has some advantages over all others, as the colours are so defended by the gummous or resinous bodies, that the most tender kinds stand very well, and retain their beauty to any length of time, if no violence impair them. The use of this kind of vehicle is called *painting in varnish*, which art has been greatly improved and extended within these few years by the manufacturers at Birmingham; and will probably hereafter, when the conveniences and advantages of it are more generally known, be applied to purposes of greater account with respect to this species of painting.

It has been lately a practice with some eminent portrait painters to make a compound vehicle by mixing oil and varnish together; and this likewise is by them called *painting in varnish*; though it ought, I think, rather to be called *painting with varnish*. The advantage that has principally induced them to use this method is the quick drying of the colours, which is the result of it; but time will shew them another yet greater advantage in it, I mean the preservation of the colours, to which it will greatly contribute. The varnish used for this purpose must be formed of oil of turpentine; but the particular composition we shall have occasion to speak of below.

SECT. II.

Of Oils in general.

OILS of a nature suited to this purpose have been the most commodious and advantageous vehicle to colours hitherto discovered. First, because the unctuous consistence of them renders their being spread and laid on more expedite than any other kind of vehicle. Secondly, because when dry they leave a strong gluten or tenacious body that holds together the colours, and defends them much more from the injuries either of the air or accidental violence than the vehicles formed of water. Several qualities are not, however, constantly found in the kind of oil proper for painting, which are, nevertheless, indispens-

ably requisite to the rendering them a proper vehicle for all purposes. But the want of some of these can in many cases be dispensed with; and one of them, we shall first mention, remedied by art in a great degree.

The principal and most general quality to be required in oils is their drying well; which, though it may be assisted by additions, is yet to be desired in the oil itself; the effect of the pigments used in it are sometimes such as counteract those of the strongest dryers, and occasion great delay and trouble from the work remaining wet for very long time, and frequently never at all becoming dry as it ought: and, indeed, there are some parcels of the oils which have this vice in an irremediable degree.

The next quality in oils is the limpidness or approach to a colourless state, which is likewise very material; for where they partake of a brown or yellow colour, such brown or yellow intermixes itself necessarily with the tint of the pigments used in the oil, and of consequence degrades it. But besides the brown colour which may appear in the oil when it is used, a great increase of it is apt to succeed in time, if the oil be not good; and therefore it should be guarded against as much as possible, where it may be of ill consequence.

Both these qualities are, however, greatly remedied by keeping the oils a long time before they be used, and even rancid oil, though much the most faulty in these respects, is greatly improved by time, and sometimes rendered fit for almost any purpose whatever.

There are three changes that oils of the kind proper for painting are liable to suffer in their nature, and which affect them as vehicles that are confounded by painters under one term, viz. *fattening*; notwithstanding these several changes are brought about by very different means, and relate to very different properties in the oils.

The first is the coagulation before spoken of by admixture of the oils with some kinds of pigments unduly prepared. This indeed is called the *fattening of the colours*; but the real change is in the oils, and the pigments are only the means of producing it. This change is generally a separation of the oil into two different substances; the one a viscid pitch body, which remains combined with the pigment; the other a thin fluid matter, which divides it from the colour and thicker part. This last appears

in very various proportions under different circumstances, and in some cases it is not found at all, where the pigment happens to be of a more earthy and alkaline nature; for then only a thick clammy substance, that can scarcely be squeezed out of the bladder, if it be put up in one, is the result of the fattening. This fattening not only happens when oil and pigments are mixed together, and kept for any length of time in bladders or otherwise; but even sometimes after they have been spread or laid on the proper ground: for then, instead of drying, the separation will ensue, and one part of the oil will run off in small drops or streams, while the other will remain with the colour without shewing the least tendency to dry.

The second is a change which happens in oils from long keeping, by which they grow more colourless, become more ready to dry, and acquire a more unctuous consistence. In this case the oils are said to become *fat*; though they are in a very different state from that above-mentioned, which is caused by unsuitable pigments; for where this change does not exceed a certain degree, it is, as before said, every way a great improvement of the oils.

The third is a change produced by artificial means, from exposing the oil a long time to the sun and air, (of the particular manner and use of which we shall speak more fully in its proper place) whereby it is freed from its grosser and more feculent parts, and rendered colourless and of a more thick and less fluid consistence than can be produced by any other treatment. But at the same time they are made more reluctant to dry, particularly with vermilion, lake, Prussian blue, brown pink, and King's yellow; and depraved by the acquiring other bad properties that disqualify it for common use as a vehicle in painting. These qualities, nevertheless, may be rendered advantageously subservient to some particular purpose. But the nature, and even the preparation of fat oil is less understood at present than one could imagine it possible, with regard to a substance of so much consequence, both in some kinds of painting, and several other kindred arts. Oils in this state are called also *fat oils*, though it is a change that has not the least affinity with either of the other; but, on the contrary, differs oppositely from both of them in some very essential circumstances.

In speaking therefore of the fattening of oils or colours, attention should be had to the not confounding these three several kinds one with another. This can scarcely be avoided in some cases, but by considering the occasion where the term is used, and judging from the circumstances which kind is meant.

These are the several qualities by which oils are rendered suitable to, or improper for, the purposes of painting. When they dry quickly, are colourless, (especially through age) and are somewhat fat in the second of the above senses of that word, they are perfect with respect to the wants of painters. Where they dry, though more slowly, they may, nevertheless, be improved to a tolerable state by additions; and where they are discoloured, they may serve for some uses; but where, as is frequently found, they will dry only in a great length of time, or not at all, they are absolutely unfit for this application.

SECT. III.

Of particular Oils.

OF LINSEED OIL.

LINSEED OIL is expressed from the seed of line by those who manufacture it in large quantities, and have mills turned by water for the more expeditious despatch of the work. It is the principal oil used in all kinds of paintings; or, indeed, the only kind, except for some very nice purposes, where its brownness renders it unfit. The general defects of linseed oil are this brown colour, and a tardiness in drying; both which are in a much greater degree in some parcels than others. There is also sometimes found such, as, in consequence of its being commixed with the oil of some other vegetable (accidentally growing with it) that partakes of the nature of olive oil, cannot be brought to dry by any art or means whatever.

The goodness of linseed oil, therefore, consists in its nearer approach to a colourless state, and in its drying soon. Its state, with respect to the first quality, may of course be distinguished by inspection only; but the latter can only be discovered by actual trial of it, for there is no

particular appearance, or other perceptible mark, attending this quality.

Linseed oil is in general used without any other preparation than the mixing it with the proper dryer; but the keeping it a considerable time before it be used will always be found to improve it. It is, nevertheless, used sometimes, after it is prepared into the state of drying oil, not to commix and make other unprepared parcels dry, but alone, as the sole vehicle of the colours. The convenience of this is the speedy drying of the paint so composed; but it cannot be practised where the beauty of the colour is of the least consequence, for the oil imparts in this case a very strong brown to the mixture.

OF NUT OIL.

NUT OIL is the oil of walnuts pressed out of the kernels by means of a screw press. It is used for the mixing with white flake, or other pigments, where the clearness of the colour is of great consequence, and would be injured by the brownness of linseed oil.

It is used without any other preparation than keeping, which is always of advantage to it, both with regard to its colour and quality of drying.

The faults of nut oil, when not good, are the being turpid and not perfectly colourless, and the drying too slowly. The first shews itself, but the other must be examined by trial. If, however, there be no adulteration in the case, time will generally cure it of all these defects.

Whoever would have nut oil perfectly good, should peel off the skin of the kernels before they be pressed, in the same manner as when they are eaten; for the skins contain an acrid oil of a very different nature from that of the white substance of the kernel, which is extremely subject to turn brown, or even black, and consequently tinge the other when commixt with it.

OF POPPY OIL.

POPPY OIL is expressed from the ripe seed of poppies, in the same manner as nut oil from the walnuts. Its qualities and uses, as likewise its defects and the remedy for them, are also much the same as those of the nut oil; on-

when it is perfectly good, it is more clear and limpid, and will dry better than the best nut oil whatever.

OIL OF SPIKE OR LAVENDER.

OIL OF SPIKE OR LAVENDER are essential or distilled oils, obtained by distilling the spike, or any other lavender, with water. It is used in painting only as the vehicle for laying on the composition formed of the flux and colours in enamel painting; which by its fluidity it renders capable of being worked with a pencil; its volatile nature afterwards making it wholly dry away without leaving any matter that might effect the substances of the enamel, which would be otherwise if any but an essential oil were used.

Oil of spike or lavender is subject to be adulterated by the oil of rosemary, which, though much of the same nature, yet being of a less unctuous or thick consistence, is not so well adapted to make the colours spread and work well with the pencil. This adulteration is not easily discoverable, where it cannot be distinguished by the smell; and the best method, therefore, to be certain of the goodness of the oil of spike or lavender for this purpose is to make an actual trial of it.

SECT. IV.

Of particular Dryers.

OF DRYING OIL.

DRYING OIL, or other oils, is formed of linseed oil, prepared by the means of boiling, sometimes with the addition of other substances, and sometimes without. The substances added to oil in this preparation are very various; there being many different recipes in the hands of different persons, some of which prescribe a less number of ingredients, and others almost every kind. These substances are white vitriol, sugar of lead, seed-lac, gum asphaltic, gum sandarac, gum animi, gum copal, umbre, alcohathar, litharge, and red lead. But the first eight of these articles being dearer, when great quantities of drying oil are prepared for common purposes, they are usually

omitted, and the others, or some of them, only employed; and, indeed, if the linseed oil be good, and boiled for a proper time, even alone, it will have nearly the same properties as if the most efficacious of these substances be added to it. I will, however, give two of the most approved recipes for preparing drying oil with the addition of the usual ingredients. The one for the kind supposed proper for the more nice and delicate painting, the other for common work.

“ Take of nut or poppy oil one pint, of gum sandarac two ounces, of white vitriol, and sugar of lead, each one ounce. Boil the whole till the solid ingredients be dissolved, and the mixture be of the colour of linseed oil.”

This oil will dry fast, and mixed with an equal quantity of nut oil, and the proportion of oil of turpentine each person may find most convenient to use, will prove an excellent mixture for all purposes where a small degree of yellow is not injurious; or, in other words, for all purposes but forming the purest white tint. It will also, when mixt with any other oil, render it capable of drying well without the least hazard of fattening, however disposed to it; and it may be therefore used for all nicer purposes where common drying oil would be injurious by the brownness of its colour.

Drying oil may be well prepared for coarser work, according to the commonly approved method, in the following manner:

“ Take of linseed oil one gallon, of litharge of gold or silver one pound, of white vitriol half a pound, of sugar of lead, gum Arabic, and umbre, each a quarter of a pound. Boil them so long as the discolouring the oil, which is the gradual consequence of the boiling, will permit it; for the oil must not be burnt till it approach too near to blackness.”

The drying oil prepared in a simple manner, as by those who make it for sale, will not differ much from the above in its qualities, though it be prepared as follows:

“ Take linseed oil one gallon, red lead one pound and a half. Boil them so long as the colour will bear it.”

This last may be much improved by the addition of gum sandarac, and will then be perhaps more useful than the more complex and expensive composition above given.

Indeed a gallon of linseed oil, in which two pounds of gum sandarac and one pound of gum Arabic has been dissolved, is the drying oil I would recommend for common purposes; and it need not be boiled near so high as that sold in the shops. For, as the gums give it a very considerable body, the colours may be brought to a proper state for working by a little of this with a larger proportion of spirit of turpentine, either with or without the addition of unprepared oil; and consequently the proportion of brown given to the colour is less than where a greater quantity of the oil must be used.

The drying oil of any kind may be boiled in a earthen pipkin, or iron pot; but great care must be taken in the operation, if it be performed within any building, that the matter do not boil over; which, when it happens, greatly endangers the firing-such building. It is therefore much better, especially where any larger quantities are made, to have an iron furnace that can be moved about, or to build an occasional one of bricks; which, for this purpose, may be done without mortar. It need only be a cylinder of bricks, in which a frame with bars to support the fuel is fixed, with a hole about eight inches above the bars for feeding the fire, and another in the highest part of the hollow for venting the smoke.

When the drying oil is taken off the fire, it may, while yet hot, be strained through flannel; but if umbre, or any ingredients which will not dissolve are added to it, it should first stand to settle; that the clearer part may be poured off from the grosser; and after straining, if any sediment appear, the oil should be again decanted off from it, and the foul part heated and passed again through the flannel.

OIL OF TURPENTINE.

OIL OF TURPENTINE is distilled from turpentine. It is an ethereal oil which quickly exhales in the air, and if mixt with linseed, nut, or poppy oils, in flying off carries with it the more volatile part of such oils, and causes them to dry much sooner than they would otherwise. On this account it is very generally used as a dryer to mix with the other oils; for which purpose it has greatly the ad-

vantage over drying oil, with regard to colour, as it is perfectly transparent and white.

It is used without any other preparation than mixing it either alone or together with drying oil, with the other oils and colours; and it is not subject to any adulteration except the dissolving crude turpentine or resin in it, which do not greatly injure it with regard to this application of it. Such adulteration may however be perceived, when in a greater proportion, by a slight degree of yellow colour and glutinous consistence; the unsophisticated being quite limpid, and without the least tenacity. When in a less proportion, the adulteration may be discovered by evaporating part of what is suspected with a very gentle heat, as a resinous or terebinthinate substance will be left behind, if any such have been mixt with the oil.

OF SUGAR OF LEAD.

SUGAR OF LEAD is a chymical preparation of lead by dissolving it in vinegar, and reducing the salt formed by the combination of the lead with the acid of vinegar to a crystalline state. But as sugar of lead may always be had at the shops of chymists, druggists, and colourmen, and at a much less expence than it can be made in small quantities, it is needless to give any more particular recipe for the making it for the purposes of painting. It is supposed to have a quality when mixt with oils of rendering them much more prone to dry, and on that account is very frequently used, as well in the making drying oil, as in the common use of the oils where it is ground up with them together with the colours. It requires no other treatment but to be well commixt with the oil with which it is used and it is not subject to any adulteration if it be obtained in its crystalline form and not powdered; for there the appearance alone is sufficient to shew whether it is clear from any mixture of heterogeneous matter.

It is, notwithstanding, the general confidence which painters have in this substance as a dryer, dubious whether the use of it, except in the preparation of drying oil, answers in any material degree the end; for though it may assist the heat in producing that change in oils which renders them drying oils, yet it does not necessarily follow that any such effect is produced by it without heat; though

is very probable that the supposition of this has been the occasion of its being introduced into practice as a dryer that will operate on oils by barely mixing it with them.

OF WHITE VITRIOL.

WHITE VITRIOL is a mineral substance found in Hungary and many other places. It is used in the same manner, and for the same purposes in painting as sugar of lead, with which it is generally joined in practice, both in the making drying oils, and the admixture with the common oils and colours. It is not liable to be adulterated, on account of its low price; but it has not been unusual to sell common green vitriol or copperas calcined to whiteness in the place of it; and as they are very different substances, this ought to be guarded against. Those who are acquainted with the appearance of both, may easily distinguish them by view. But others may make themselves certain they are not imposed upon in this particular, by putting a small piece into the fire on a poker, or any other way; when, if the parcel in question be true white vitriol, no redness will come upon it; but if it be the green vitriol calcined to whiteness, it will turn red by this greater heat, and have the appearance of Indian red, or brown ochre.

What was said of the dubiousness of the efficacy of sugar of lead as a dryer, except in the preparation of drying oil, holds equally good with respect to white vitriol, though, from a strong persuasion of the contrary, it is used very generally, and in a large proportion.

SECT. IV.

Of the Substances used for rendering Water a proper Vehicle for Colours.

OF GUM ARABIC.

GUM ARABIC is a transparent gum brought from Africa and the Levant, that is easily soluble in water, which it renders viscid. From these qualities, and the drying with a considerable degree of tenacity, it is the best

ingredient for making an aqueous vehicle for colours hitherto known in Europe. When good, however, as it is apt to become dry, it is subject to crack and separate from the cartoon or grounds on which the colour is laid with it, from whence some mixture becomes necessary to remove this defect.

The goodness of gum Arabic must be concluded from its transparent whiteness, the being perfectly dry and brittle, and free from all dust and heterogeneous matter. Gum Senegal, which is of lower price, is frequently sold for it; but this fraud may be easily guarded against by taking care to observe that it be not soft and clammy, which qualities are always in some degree found in gum Senegal.

There is no other preparation necessary for gum Arabic, previously to being used with the water, except powdering it, in order to its dissolving the more easily; only it is proper to pick out all brown and discoloured pieces, or any foulness that may accidentally be in it.

OF GUM SENEGAL.

GUM SENEGAL is much of the same nature as gum Arabic, and applicable to many of the same uses; but it is apt to retain some proportion of moisture, which consequently renders it more soft and clammy. This property makes it, when alone, a less fit ingredient for a vehicle for water colours than gum Arabic; but yet, nevertheless, a third or fourth part of the gum Senegal, mixed with the gum Arabic, will greatly improve it. For, as the gum Senegal is too slow and reluctant to the drying perfectly, so the gum Arabic, on the contrary, dries in too great a degree; and a due mixture of them therefore produces the proper medium or temperament betwixt the two extremes.

The treatment of the gum Senegal, when used in a vehicle for water colours, must be in all other points the same as the gum Arabic.

OF SIZE.

SIZE is made of leather boiled in water till it becomes of a viscid consistence.

It is a very proper ingredient for a vehicle for colours used in water in larger works; but its reluctance to be redissolved after it has been mixed with colours and is become dry, renders the employing it incommensurable in miniature painting. Size is commonly prepared in great quantities by those who make a trade of manufacturing it, together with glue, from all refuse pieces of leather and skins of beasts; but where it is wanting in painting for nicer purposes, it should be prepared from the cuttings and shreds of the gloves in the following manner:

"Take any quantity of the shreds or cuttings of gloves leather, and put to each pound a gallon of water; boil them six or eight hours, recruiting the water, so that it shall not diminish to less than two quarts. Then take it off the fire, and strain the fluid through flannel while hot; and afterwards evaporate it again, till it become of the consistence of a jelly when cold."

OF SUGAR AND SUGAR-CANDY.

SUGAR and WHITE SUGAR-CANDY are used as ingredients to render water a vehicle for colours in miniature painting. The intention of them is to prevent the colours from cracking when mixed with gum Arabic; which the sugar prevents, by hindering that perfect dryness and great shrinking which happens on the use of gum Arabic alone, and also to make the gum water work more kindly with the pencil. There is no preparation of the sugar and sugar-candy necessary before they be used, except powdering to make them melt the more easily.

STARCH.

STARCH is sometimes used instead of sugar-candy for mixing with the colours that are used in strong gum-water, to make them work more freely, and to prevent their cracking. It is a kind of secret with some persons, who lay a considerable stress upon it.

OF ISINGLASS.

ISINGLASS is a glue formed from the cartilages of a large fish, which is found in the rivers that flow into the

northern seas. It is used in miniature painting, in the same manner as the gums Arabic or Senegal, for rendering water a proper vehicle, by giving it a due viscosity for spreading and binding the pigments of an earthy texture.

SECT. VI.

Of the Substances used to render Spirit of Wine a vehicle for Colours.

OF SEED-LAC.

SEED-LAC is a substance formed on the boughs of trees by small flies as their nidus or habitation. It dissolves in spirit of wine, and being left dry again by the evaporation of the spirit, re-attains its original hard and tough texture. It is therefore extremely beneficial in defending and securing colours from any injury the air or slight violence might do them. But the brownness of its colour, and its not rendering the spirit of wine, in which it is dissolved, of a consistence sufficiently thick and viscid to suspend the powdered pigments when they are commixed with it, are defects which greatly destroy its value as an ingredient for making spirit of wine a proper vehicle for colours. It may, however, be improved for this purpose by the addition of turpentine and other substances, as we shall observe in its due place.

The goodness of seed-lac consists of its approaching towards a transparent colourless state, and being free from heterogeneous matter and opaque parts; for as the brownness is its greatest defect, the diminution of that quality consequently enhances its value.

The preparation of seed-lac for mixing with the spirit of wine, is to pick out, or wash from it by means of water, all the little woody or other feculent parts, and then to powder it grossly; for if it be reduced to a fine powder the whole will run together, and cohere so as to hinder the spirit of wine from commixing with the particles and dissolving them. Those who want seed-lac for using with colours where whiteness or brightness are demanded, must pick out the lightest coloured grains, and use them only, reserving the browner for coarser purposes.

OF SHELL-LAC.

SHELL-LAC is a substance brought hither in very thin pieces, and partaking greatly of the nature of seed-lac; from which, nevertheless, it differs so much in some properties as clearly shews they are not the same substance under a different form, as has been supposed by many. Shell-lac dissolves in spirit of wine as well as seed-lac, but never becomes perfectly clear and transparent. To compensate however for this defect, it renders the spirit much more viscid, and capable of keeping the colours suspended, from whence it derives a considerable value in this kind of painting.

The goodness of shell lac consists in its approaching to transparency and whiteness; but it is never found without a great degree of brownness. There is no more preparation of shell-lac than seed-lac required previously to its being used for this purpose with spirit of wine, the reducing it to gross powder being the whole.

OF TURPENTINE.

TURPENTINE is capable of dissolving in spirit of wine, and giving it a viscid consistence; on which account it is sometimes used along with other bodies to render the spirit a fit vehicle of colours. A composition formed of it with mastic, sandarac, resin, and in some cases seed-lac, will serve for purposes where the painted body is not subject to great rubbing or any violence; but with respect to hardness and durableness, all such compositions fall far short of the solution of shell-lac.

Turpentine must be chosen by its clearness and purity, and requires no preparation previously to its being applied to this purpose.

OF THE GUMS MASTIC AND SANDARAC.

The **MASTIC** and **SANDARAC** are much of the same nature, and applied to the same purposes with regard to painting. They are gum resins entirely white and transparent when good, and dissolve perfectly in spirit of wine, on which accounts they are used for rendering spirit of wine a vehicle for colours; but they are of so soft a na-

ture, and so ready to melt with a slight heat, that the colours laid on with them would sully and be injured even by a gentle handling. On this account they require to be mixed with seed-lac; and, to inspissate the mixture sufficiently to suspend the colours, some turpentine is also necessary.

Mastic and sandarac must be chosen for their whiteness and transparency, and require no other preparation for this use of them than to be well picked and powdered.

OF RESIN.

RESIN is the *caput mortuum* or *residuum* left in the distillation of turpentine for extracting the oil. It is of two kinds, white and brown; the white is made when the turpentine is distilled with water; the brown, when no water is added to it. The white turpentine is used for rendering spirit of wine a vehicle for colours in the same manner as mastic or sandarac, with which it agrees in its qualities, except that it is yet less hard and more liable to sully on handling, and the same preparation and treatment is required for it as for them.

CHAP. IV.

Of the manner of compounding and mixing the Colours, with their proper Vehicles for each kind of Painting.

SECT. I.

Of the Colours proper to be used with Oils, and the manner of compounding and mixing them with the Oils and Dryers.

THE colours proper to be used in oil for red, are vermilion, native cinnabar, lake, scarlet ochre, common Indian red, *terra di Sienna* burnt, (and mixt with white)

red ochre, Spanish brown, Venetian red, and red lead;—for *blue*, ultramarine, Prussian blue, ultramarine ashes, verditer, indigo, and smalt;—for *yellow*, King's yellow, Naples yellow, yellow ochre, Dutch pink, light pink, masticot, common orpiment, *terra di Sienna* unburnt, (and mixed with white) and turpeth mineral;—for *green*, terra verte, verdigrise, distilled verdigrise, or crystals of verdigrise, and Prussian green;—for *purple*, true Indian red;—for *brown*, burnt *terra di Sienna*, (unmixed with white) brown pink, brown ochre, umbre, and asphaltum;—for *white*, white-flake, and white lead;—for *black*, lamp black, ivory black, and blue black. These are all the colours which are at present in use for oil painting in this country; and when they are perfect in their kinds, they are fully sufficient to answer every purpose. The immediate preparation of them, and the manner of compounding them with the oils and dryers, may be managed thus.

Ochres of every kind, as also all the earthy and metallic bodies, in which are included ultramarine and its ashes, ought to be well levigated by a good stone and mullar with water, and washed over before they be mixed with the oils, when they are intended for more delicate purposes. Lake, brown pink, and Prussian blue, which being of a gummy or glutinous nature, would again acquire a cohesion, if levigated in water, may be ground to an impalpable powder, by adding spirit of wine to them instead of the water, in which state they will then continue when they again become dry, and be much more easily and thoroughly commixed with the oils. Lamp black demands no preparation, nor does the asphaltum require to be commixed with oil, but with spirit of turpentine to thin it, if it be of too thick a consistence to work with the pencil.

In levigating lake or any of the pinks, as also King's yellow, Naples yellow, or verdigrise with water or spirit of wine, great care must be taken not to use a knife or other iron implement, which would greatly injure the colours. Instead of such knife, a thin piece of horn may be employed to take the colours off from the stone, or to scrape them together as they are grinding. Caution should likewise be used with regard to the boards on which they are dried, and the place where they are repositied during the drying; for the sun or dust will be very apt to

deprave some of them in this state, if they be not well kept out.

The pigments being thus duly prepared, may be ground with the oils, either on a stone or mullar when they are wanted in greater quantities; or are intended to be kept, or by the palette-knife on the palette where they are immediately to be used. But they should be perfectly mixed, or the oil will be apt to separate, and the colours fail of their due brightness and effect. For convenience, the colours designed for the nicer kinds of painting, after they are ground with the oil, are put into pieces of bladders and tied into a kind of a ball. In this state such as be perfect will continue good a long time, and the bladder being pricked and squeezed, the colour is forced out by small quantities as is required for use.

For coarser work, the colours demanded in great quantity are ground by hand or horse-mills with the oil, and the others on a stone with a mullar: after which they are put in pots, and there mixed with oil of turpentine and drying oil, according to the particular purposes to which they are employed.

Lake, Prussian blue, brown pink, King's yellow, and sometimes vermilion, are apt to be backward in drying, and require therefore to be mixed with oil that is old and well disposed to dry; and where brightness is requisite, the nut or poppy oil should be used with oil of turpentine, but where the brightness is of less moment, old linseed oil, with a third of drying oil, and the same proportion of oil of turpentine, may be substituted. The proportion however, of these, and all dryers, must be adequated to the occasion, as discretion may dictate, according to the quicker or slower disposition of the pigments used, and the time that may be conveniently allowed for them to dry. Flake white should be also used with nut or poppy oil only, and to these oils many add white vitriol and sugar of lead, as well as the oil of turpentine, when they are to be used with this or other pigments that are too slow in drying. But the effect of those substances, when used in this manner, is very dubious, as I have observed before.

SECT. II.

Of the several methods of Painting in Water, as distinguished by the Colours, Vehicles, and Grounds, required for different purposes.

THE methods of painting in water, required for different purposes, are distinguished into three several kinds. The first called painting in *water colours*, and more usually, as it is for the greatest part confined to painting in small, *miniature painting*. The second is called painting in *distemper* or *size painting*. The third is called painting in *fresco*, from its being frequently used for walls, alcoves, or other buildings in the open air.

The kind called painting in *water colours*, or *miniature*, having mostly for its subject portraits, flower pieces, or other delicate performances, finer colours are required, and more nice and elaborate means are used for rendering the water a proper vehicle; whence the choice of colours, and the peculiar preparation of the water, by the addition of fit substances to render it such a vehicle, give occasion for this to be considered as a distinct method of painting.

The kind called painting in *distemper*, being for scenes, canvas-hangings, or cielings, and other coarser works; less expensive colours, and simpler means in the preparation of the vehicle are employed; which, therefore, constitutes this also a distinct method of painting.

The third, called painting in *fresco*, being on walls or other parts of buildings, where the plaister of the wall itself without any other preparation is to form the ground, a very peculiar choice of colours is necessary, and water alone suffices as a vehicle without any addition of other substances. Whence this likewise becomes a distinct method of painting.

SECT. III.

Of the Colours to be used in the PAINTING WITH WATER COLOURS, or in MINIATURE; with the manner of Mixture, or Composition of them with the proper Vehicles.

THE colours used in what is called *painting in water colours*, or *miniature paintings*, are—for red, carmine, lake, rose pink, vermilion, red lead, scarlet ochre, com-

mon Indian red, red ochre, Venetian red, Spanish brown;—for *blue*, ultramarine, ultramarine ashes, Prussian blue, verditer, indigo, smalt, blue bice, and litmus;—for *yellow*, gamboge, Naples yellow, Dutch pink, English pink, gallstone, masticot, French berry wash, turmeric wash, zedoary wash, and tincture of saffron;—for *green*, sap green, verdigrise, distilled verdigrise, and *terra verte*;—for *purple*, true Indian red, archal, and logwood wash;—for *brown*, bistre, umbre, brown ochre, Cologne earth, and *terra Japonica*;—for *white*, flake white, white lead, calcined hartshorn, pearl white, Troy white, lake white, and egg-shell white;—for *black*, Indian ink, lamp black, ivory black, and blue black.

As water is a much less kindly substance for the spreading and working colours than oil, so there is a variety of treatment necessary for rendering it a proper vehicle for the different substances that are to be used with it. Whoever, therefore, would have a complete set of water colours, must not attempt to procure them by one general method of management, as in the case of oil, for all indiscriminately; but must attend to the nature of each, and accommodate to it such a composition of the water, and what else may be necessary to give it a due consistence, as may best suit each kind. This restriction, nevertheless, should be always observed, that nothing be used in the composition of water colours, however well it may make the colours work at the first admixture, but what will again, even though the composition become perfectly dry, so dissolve and soften on the addition of a fresh quantity of water, as, by rubbing with the pencil to regain the fluid state as on the first mixture, and to suffer the colour to work equally well as then. The best systems for the admixture of the variety of water colours hitherto given to the public, has been very defective in some material particulars, and the principal reason of it has been, their confining themselves to the use of gum water, and omitting that of isinglass size. I shall therefore be the more explicit in the directions I shall give for the management of each kind; and am satisfied, that whoever follows what I advise will find themselves under no difficulty in using all the variety of colours that are proper to be commixt with water. But, in order to avoid the repetition of the same thing in many places, it is proper first to shew the manner

of preparing properly the gum water and isinglass size. The gum water may be thus prepared :

"Take three quarters of an ounce of gum Arabic, and a quarter of an ounce of gum Senegal; powder them, and then tie them up in a linen rag; leaving so much unfilled room in the bag as to admit its being flattened by the pressure of the hand. Having squeezed the bag till it be flat, put it into a quart of hot water; and there let it continue, moving it sometimes about, and stirring the water for about twenty-four hours; the gums will then be dissolved, and the bag must be taken out. The fluid being divided into two parts, to one half of it add a quarter of an ounce of white sugar-candy powdered, and keep the other in its pure state. By this means a strong and weak gum water, each proper for their particular purposes, will be obtained."

The following method is the most adviseable for the making of isinglass size :

"Take half an ounce of the beaten isinglass, and a pint and half of water; boil them till the isinglass be wholly dissolved, and then strain the fluid, while hot, through a linen rag; divide the size thus made into two parts, and to one of them add an equal measure of hot water; by which means a strong and weak size will be likewise obtained."

Having thus prepared the gum water and size, a proper assortment of muscle shells, or small ivory dishes, must be suited to the colours, accommodating the size of each to the due proportion of each kind of colour; as it is proper to mix up a much greater quantity of white bistre, and the coarser sorts, than of carmine, ultramarine, and lake, which are to be sparingly used, on account of their great price, and are only necessary for the lights, and higher touches, in the objects of the same colour. A very smooth China or Dutch tile must be provided, as also a small ivory palette-knife; for though an iron one might be employed for some purposes, yet it is so noxious and injurious to the colours in other cases, that the use of it is best rejected for the whole.

Vermilion, ultramarine, ultramarine ashes, red lead, carlet ochre, common Indian red, true Indian red, yellow ochre, Venetian red, brown ochre, verditer, indigo, mastic, umbre, *terra veris*, bice, Cologn earth, white lead,

calced hartshorn, ivory black, and blue black, having been previously well ground and washed over, must be mixed first on the tile, by means of the palette-knife, with as much of the strong gum water as will bring them to the right temper to work with the pencil. Then while they are yet wet, they must be scraped from off the tile and spread with the finger in the shells intended for them, where they will be ready for use at all times, on moistening them duly with a little fresh water rubbed upon them by the finger or pencil.

Prussian blue, lake, and Naples yellow, if it be used, should be first reduced to an impalpable powder, which may be best done for this purpose by levigation on the stone in spirit of wine. Then they, as also carmine, bistre, Dutch pink, and English pink, should be well mixed, by grinding on the tile or palette with the ivory knife, with as much of the weaker gum water before mentioned as will bring them to a proper consistence; after which they should be disposed of in their proper shell, as was before directed for the other.

Gamboge, Indian ink, sap green, galls-stone, and *terra Japonica*, as they become of a viscid and adhesive nature when wet, require no gum water. They should be only moistened and rubbed on the shells till the surface be incruusted with a proper quantity; which by the addition of a little water may be worked off with the pencil in the same manner as the other colours.

Verdigrise, though used with water colours, cannot nevertheless be brought to a proper state for working by means of water. The method of rendering it fit to be used in water colours is to powder it, and then pour on a quantity of vinegar in the manner before directed for the making the crystals of verdigrise. This vinegar when it has dissolved as much of the verdigrise as it can take up, must be poured off free from the settlings: or the dissolved part of the verdigrise, and must be put into a bottle to be kept for use. The kind of bottles the most fit for using with this, or the following substances in miniature painting, would be a small sort of such as are made for ink bottles; in which the wideness of the neck, and the shallowness of the body, make it easy to dip the pencil and the broadness of the bottom, proportionably to the height, prevents their being so liable to be thrown down

as those of any other form. The verdigrise may likewise be prepared for miniature painting by means of the juice of rue; which, being poured on the verdigrise after it is well powdered, will dissolve it in the same manner as vinegar, and render it fit for use by the same treatment. The verdigrise thus dissolved becomes a truer green than when vinegar is employed, and it is much better adapted to miniature painting in this state; for, as the juice of rue has not the acid quality of the vinegar, it does not, like that, change or destroy several of the other colours, particularly the litmus blue and archal, and is therefore greatly preferable; for, indeed, the solution of verdigrise, tho' a very good green wash, is not to be used with a variety of other colours without great care; and for this reason sap green for the most part is chosen to supply its place.

The litmus blue must likewise undergo a preparation by other means than the addition of water before it be fit to be used in miniature painting; the most approved method of which is as follows:

"Take an ounce of litmus, and boil it in small beer 'till they remain only about one fourth of the fluid. Strain it then, while boiling hot, through flannel; and when it is cold, being then of a glutinous consistence, add as much warm water to it as will bring it to due fluidity for working. This must be used in the same kind of bottle as the verdigrise."

Archal, the yellow berry wash, and turmeric wash, logwood wash, and tincture of saffron, need no other preparation than has been before mentioned in their original production; but they must be put in the same bottles, and used as the solution of verdigrise and litmus blue.

Gamboge, Indian ink, sap green, gall-stone, and *terra Japonica*, as they readily dissolve and become transparent in water, are true washing colours, as are also those last mentioned, which are to be in a fluid form. But neither the verdigrise, litmus, or the yellow washes, are safely to be used for glazing over other colours, as they are either liable to suffer themselves by such treatment, or to do injury to those they are laid upon.

Carmine, ultramarine, and bistre, are also used as washing colours, as they will have an effect of that nature when spread very thin; but they are not, nevertheless, properly speaking, washing colours, as they are in fact opaque.

As the producing this effect of washing is of great use, as well in miniature painting as in the colouring of prints and maps, I will here impart a method by which the end may be compassed in a very serviceable degree, even in the case of vermilion, red lead, Prussian blue, lake, or even the most opaque colours. This is to be done by mixing the pigments I have before directed to be compounded with the strongest gum waters, with the strongest kind of isinglass size above-mentioned, and to substitute likewise the weakest size in the place of the weaker gum water, for the colours where that is ordered. So prepared, the heavier colours will work and spread as well as carmine, bistre, or any other substances, except those wholly fluid; and may be used with great convenience and advantage, not only where washing colours are wanted, but likewise for shading, touching, and finishing, or any of those purposes where the free working of the colours is particularly requisite in miniature painting. In the Prussian blue, lake, &c. it is proper, however, in order to prevent their cracking, to add sugar-candy or honey to the size, in the proportion of half the weight of the isinglass; in which case they will be found to work more commodiously in this vehicle than any other formed of water. Of which advantage the Chinese are so sensible, that all their other compositions for using colours in water seem to be of this kind, as well as that most useful one called *Indian ink*.

SECT. IV.

Of the Colours fit to be used in Distemper, or Painting with Size; and the manner of mixing or compounding them with the proper Vehicles.

B*Y distemper* is meant all paintings on scenes; hangings of rooms, or other parts of buildings, where size is used. The same colours which are employed in miniature painting may be used in this kind with size. Only this method being principally confined to scenes and grosser sorts of work, where the effect depends more on the perspective art and the opposition of the colours than on their brightness, the dearer kinds are wholly omitted, or sparingly used.

The best method of compounding the colours with the vehicles, is to mix the size in water; then to levigate the colours in part of it, and afterwards to put each kind in a proper pot, adding as much more of the melted size as will bring it to a due consistence for working, and mixing the whole well together in the pot with a proper brush, or wooden spatula. If the quantity of water originally put to the size do not render it sufficiently fluid for grinding the colours, the fault may be easily remedied by adding warm water to it; and the same may be done likewise, if, after the mixture of colours, the whole be found too stiff for working.

The compositions of the colours and size must be prevented from drying, by tying bladders over the pots, or some other such means; for when once they are grown dry, they cannot be brought again to a working state without difficulty and trouble.

Though the grounds, the laying in, and grosser parts of this kind of painting, be done by this mixture of the colours with size, yet in higher-finished works that require the finer colours, the more delicate parts may be best executed by using the gum waters or singlafs, as above directed in miniature painting. By this means the mixing up greater quantities of the dear colours may be avoided, though otherwise necessary, as it is impracticable to keep minute quantities from drying, which, in the size, renders them unfit for working till they are again reduced to proper condition by means of heat; but in the others is not attended with the least inconvenience.

SECT. V.

Of the Colours proper to be used in fresco Painting, and the mixture of them with the Water.

THE colours used in fresco paintings may be all such as will stand the air without flying, and bear the contact of wet lime without changing. These qualities are scarcely to be found in those formed of the parts of vegetables, and therefore mineral and fossil bodies should be employed. With this restriction, any of the colours before mentioned, either as proper in oil or water may

be admitted, but more especially those which derive their colour from nature.

The method of compounding the colours for this kind of painting with the water, is by simply mixing them with the water after being previously well levigated, observing such proportion as will render them most agreeable to the pencil.

SECT. VI.

Of the Colours proper to be used in varnish Painting, and the manner of mixing and compounding them with the proper Vehicles.

IN painting in varnish, all pigments or solid colours whatever may be used, and the peculiar disadvantages which attend several kinds, with respect to oil or water, cease with regard to this sort of vehicle; for they are secured by it, when properly managed, from the least hazard of changing or flying, and will all work well, provided they be previously reduced to the state of an impalpable powder.

The preparation of colours for this use consists therefore in bringing them to a due state of fineness. This may be best done by grinding on the stone such as are of a cohering texture, as lake, Prussian blue, indigo, verdigrise, and distilled verdigrise, in spirit of wine, or oil of turpentine; which last I think the better of the two for this use. But all the ochres, or other earthy substances, together with vermilion, red lead, and turpeth mineral, require only to be previously well washed over; and carmine, ultramarine, and King's yellow, are necessarily in due state when well prepared in their original manufacture.

The best composition of varnish for spreading and penciling the colours, with respect to the convenience of working, and the binding and preserving of them, is shell-lac with spirit of wine. This, when judiciously managed, gives such a firmness and hardness to the work, that, if it be afterwards further secured with a moderately thick coat of feed-lac varnish, it will be almost as hard and durable as glass, and will bear any rubbing, or wear, or even scratching with a sharp-pointed instrument, almost as well

enamel. The manner of preparing the shell-lac varnish is as follows :

“ Take of the best shell-lac five ounces ; break it into a very gross powder, and put it into a bottle that will hold about three pints or two quarts. Add to it one quart of rectified spirit of wine, and place the bottle in a gentle heat, where it must continue two or three days, but should be frequently well shaken. The gum will then be dissolved, and the solution should be filtered through a flannel bag ; and when what will pass through freely is come off, it should be put into a proper-sized bottle, and kept carefully stopped up for use. The bag may also then be pressed with the hand till the remainder of the fluid be forced out ; which, if it be tolerably clear, may be employed for coarser purposes, or kept to be added to the next quantity that shall be made.”

The shell-lac varnish being thus prepared, a proper quantity of it must be put into small phials of a long form, or into small tin vessels nearly of the form of glass phials, in such proportion that they may never be filled above two thirds. The colours must be added to the varnish in these phials very gradually, and well shaken with it as each quantity is put in, till the proportion appear fit for working, which must be known by trying with a pencil. If the varnish appear too thick, the fault must be remedied by the adding a little rectified spirit of wine, which will any time immediately dilute the mixture to the proper degree. The phials, or tin vessels, in which the colours mixed with the varnish are kept, must be always securely stopp'd, to prevent the exhalation of the spirit, and they may be preserved in a working state in that manner for almost any length of time. But they must be always well shaken before they be used, as well as during the time of using, at proper intervals, otherwise the colour will be apt to settle to the bottom.

This is by much the best method hitherto found out of painting in varnish ; the shell-lac not only rendering the spirit of wine capable of suspending the colours much better than any other composition of this nature, but giving them tenacity and hardness that would render paintings of copper almost eternal, if not injured by fire or some extraordinary violence. It were to be wished, that in very elaborate works this method had been always pursued in-

stead of painting in oil, which is subject to so many accidents from slight external violences, besides the decay and injurious change which the oil and colours suffer from their own internal nature, and the improper means of cleaning; that few pictures or paintings of older date are to be found perfect.

There are, however, other compositions of varnish, which are used for painting; as the seed-lac varnish, and also the following; which requires, however, previously, the preparation of the mastic varnish, that must be thus made.

“Take five ounces of mastic in powder, and put it into a proper bottle with a pound of spirit of turpentine. Set them to boil in *balneo marie* till the mastic be dissolved; and if there appear to be any foulness, strain off the solution through flannel.”

The mastic varnish being thus prepared, it may be converted into a proper varnish for painting by the following method.

“Take then gum animi one ounce, grind it on the stone with water till it become an impalpable powder. Then dry it thoroughly, and grind it again with half an ounce of turpentine, and afterwards with the colour, moistening it with the mastic varnish till the mixture be of a due consistence for working with the pencil. It must then be put into phials or tin vessels, as was before directed for the composition with shell-lac, and diluted, where there may be occasion, with spirit of turpentine.”

This is inferior in all respects to the shell-lac composition, except where touches of pure white, or very bright colours, are wanted, which suffer by the brownness of the shell-lac, and are preserved in this that is nearly colourless. On which account, in the painting of flowers and draperies in miniature, the fine colours may be used with advantage this way to heighten the lights, and the rest may be painted with the shell-lac varnish.

The method of painting in varnish is, however, more tedious than in oil or water. It is therefore now very unusual in the japan work, for the sake of despatch, to lay the colours on with oil, diluted with oil of turpentine, taking care to have the mixture very thin, and to make the work rise from the surface as little as possible. When

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the whole is perfectly dry, it is again laid over with several coats of thick seed-lac varnish, which secures the colours extremely well, though not so as to render the whole equally hard and strong with the work done in shell-lac varnish.

The method of painting varnished work with oil may be greatly improved, by dissolving the white gums or resin in the oils, as was before advised, p. 123, for common oil painting, in cases of more delicate and valuable undertakings. This composition being diluted with oil of turpentine, would work equally well with, dry much harder, and assimilate more with the texture of the varnish laid over or under the paintings, than the oils simply used. It would likewise be attended with another advantage; which is, that the work would be sooner dry, and fit to receive the upper coats of varnish, which in large manufactures is an object of consequence.

The manner of preparing the seed-lac varnish and using it, being the same for this as for other purposes, will be shown in its proper place.

CHAP. V.

Of the Nature and Preparation of Pastils or Crayons.

PASTILS or **CRAYONS** are compositions of colours, which are reduced to the texture of chalk, and used in the form and manner of pencils for painting on paper.

There is a considerable difficulty and nicety in the making to bring them to that due texture or consistence which admits of their spending freely on the paper, without being so crumbly or brittle as not to bear to have the point to be duly sharpened. For, if they be rendered too cohesive by gums or such substances as give them tenacity, they will not cast as they ought. On the other hand, if the particles are not sufficiently bound together, they take no proper hold of the grain of the paper, but lie on it like

dust; and the pencils in this condition are apt continually to have the points broken, or moulder away on the least use, to an undue thickness. To produce this fit texture, so indispensibly requisite to the perfection of crayons, many substances have been used to mix with the coloured pigments, and to give them a proper coherence. But notwithstanding the repeated experiments that have been made by numbers of persons for the improvement of this art, it is very rare to find a set of such crayons as may be called good. They are not, indeed, to be at all produced but by an exercise of some judgment and skill in the composition of each particular; and there are few persons who either have such, or will exercise their skill and knowledge in sufficient degree. Recipes are therefore blindly followed; which, as the different parcels of each kind of substance differ greatly in the proportion of their qualities, though they may agree in the general nature of them, sometimes produce good, and sometimes bad crayons, by the very same rules. Whoever, therefore, would be master of a perfect set of crayons, must inform himself of the several substances and their nature, which are proper for the composition of them, and then having general directions for the manner, must proportion and adjust the quantity of the ingredients to each other by actual trials of the effect. This may, nevertheless, be done with very little trouble, and without the danger of any loss accruing from the greatest error in the composition, since the crayons can always be wrought over again, with such additions of those ingredients in which the proportion is defective, as will remedy the fault. I shall, for these reasons, enumerate the several substances that are employed for forming crayons, and shew what particular intentions they are designed to answer, and the method of managing them to effect the end. I shall then give the particular mixtures which I believe to be best for producing each kind of colour, with the nearest general proportion of the ingredients. But in adapting the quantities more exactly to each other in every particular case I must leave to the operator, who must correct the result of his compositions by drying a small quantity of each sort formed into a crayon, after he has made the mixture. This being tried on the proper paper, if it appears faulty, the proportion of the ingredients must be

ter adjusted by adding more of that which appears to be deficient, till the due effect be produced.

All the colours which are pigments, and can be reduced to an impalpable powder, may be used for forming crayons. But it is proper, nevertheless, to be cautious, especially in more elaborate works and paintings of any value, with regard to such as are subject to fly or change; particularly rose pink, English pink, lake, and Prussian blue, which are apt to turn pale, and sometimes entirely lose their hue. With respect to white, the use of flake white, or white lead, is best avoided, on account of their frequently turning black, as there are others which will even work better, and are no way liable to any such change. But neither lake nor Prussian blue are to be wholly rejected for this purpose, when they are known to be thoroughly good, as they will stand extremely well when prepared in a right manner; only great care should be taken to be certain of the qualities of any parcel before it be used, as the far greatest part of the lake to be now met with will fly, and the Prussian blue turn pale and green in such manner as to vary the tint greatly from its original state.

Besides the coloured pigments which are used simply, some white substances are necessary for the forming a proper body to such as are of lighter tints, or where the colours are to be diluted and weakened, as in straw colours, pinks, carnations, &c. There have been many different sorts of bodies applied to this purpose, which most of them, by proper management, may be made to answer the end. The principal are flake white, white lead, tobaccopipe-clay, plaister of Paris, Spanish or Troy white, simple chalk and starch. But pearl white, that has been hitherto overlooked, is in some cases superior to any of them. In this application of white bodies to form the ground or basis of pale-coloured crayons, the greatest care should be taken; likewise, when carmine, lake, or any coloured pigment, prepared from parts of vegetables or animals, are used, that the substance employed be such as will not prey upon or change the colour; which chalk, flake white, and white lead, with the colours, are extremely apt to do when they are mixt together with the addition of any moisture. But in all such cases the pearl white and plaister of Paris should be used; and with respect to the latter, must be wholly free from lime, or it will be worse even than the others.

It is best indeed in general to avoid any such mixture of these colours, by substituting the coloured earths, or other mineral substances, in the place of those prepared from vegetable or animal substances, as they can scarcely be affected or changed by any matter used in painting; and will, in general, equally well answer the purpose, except in the case of carmine, the unrivalled brightness of which makes it necessary for pinks and carnations, as great purity and force of colour are there required.

Flake white and white lead are not so frequently used as chalk and tobaccopipe-clay for the grounds of crayons; neither, indeed, are they so fit for many purposes; as they will not mix well with many of the coloured pigments, and are liable to form too brittle pencils when cut to moderate points. The white lead has besides the dangerous quality of being subject to have its whiteness changed into the proper metallic colour of the lead, as we see in many of the older drawings and sketches where it has been used. The great whiteness of the flake, nevertheless, recommends it where touches of a very great light are required. It may not be amiss, therefore, to have a crayon of it for such occasions; but it is best to omit wholly its use in cases where the other whites will answer the purpose.

Tobaccopipe-clay was formerly in great use for forming the paler crayons; but it is much neglected now, except in those made for sale. For, besides its drying to be too hard, and not spending freely on the paper, it gives to colours a heaviness and deadness that may be avoided by the use of other whites; to some of which it is therefore on all accounts inferior. It may however serve for ordinary occasions, as it will produce crayons by being simply mixed with the coloured pigments: and therefore requires much less skill and trouble to be compounded with than the softer whites that demand the aid of some binding or glutinous body to give them a due cohesion.

Plaster of Paris has also been frequently used for the basis of pale crayons, to which purpose it is in one respect well adapted; because, when it is pure, that is to say, when made only of the powdered alabaster, it is very innocent with respect to the more tender colours; but then it is cohesive, and wants the flakiness of chalk; which defect has been attempted to be remedied by the dipping of the crayons formed of it in olive or linseed oil.

Spanish or Troy white, which, as we have seen before, is made of chalk and alum calcined and washed over, is used by painters for a ground for the pale crayons. The difference in its effect from simple chalk washed over consists only in its being less liable to prey on the colours made from the parts of vegetables or animals. But as the pearl white, or plaister, are much less hazardous in that point than either, the use of it seems no way necessary.

Chalk is the best adapted by its texture to the forming the ground of pale crayons of any of the whites hitherto used, as it will cast more freely, and at the same time retain due cohesion, when mixt with proper binders or glutens, better than any of the other whites now in practice. It is, therefore, much the best substance for mixing with all the coloured pigments which are not subject to be changed; but with respect to such as are, the pearl white, or plaister of Paris, should be substituted in its place. It is also the best for forming white crayons for common purposes, which may be done by a very simple treatment, as below directed.

Starch has been frequently used along with some of the other whites for giving a due texture to crayons. But it is no where necessary, except in the case of white flake; and, as the prepared flake white of the shops contains a large proportion, it is unnecessary when that is used, which will generally be the case, as the levigation of the white flake is too troublesome for those who do not make such matters their business.

The last class of substances used in the composition of crayons, and on which indeed principally depends their perfection, is the binders or glutens required to give pulvinate bodies, of which the crayons are composed, a due elasticity to render them capable of being formed into masses that will bear the form and employment of pencils. There has been a variety of different matters applied to this purpose, most of which may in some degree effect it; but the principal are ale wort, gum tragacanth, gum Arabic, size, milk, oatmeal, sugar-candy, olive oil, and linseed

The wort of ale or beer, either in its original state, or rendered more thick by boiling, has been found to answer the end of a binder, for the forming crayons, where chalk or earthy bodies are used, better than any of the others, as

it gives them a proper cohesion, by its viscosity, without drying to that brittle state to which the gums are subject. It is not, however, in the case of vermilion, and some other substances, which have no cohesive attraction of themselves, sufficient alone to give the due tenacity; and must therefore be assisted by gum tragacanth, or size, or some such other viscid matter.

Gum tragacanth is used as a binder, by dissolving it in the ale wort, or whatever fluid is employed for the tempering crayons. It is preferable, for this purpose, to gum Arabic, or the other gums which dissolve in aqueous fluids, because it thickens in the water, and mixes itself equally throughout the whole substance of the composition when dry; whereas the others are apt to form a crust on the outside of the mass, and render the pastils or crayons of an unequal texture.

Gum Arabic has been also used for tempering crayons in the same view as gum tragacanth; but, for the reason just given, is much inferior to it.

Size is also sometimes applied to the same purpose in making crayons as gum tragacanth, and differs not greatly from it in its effect.

Milk has been used for the composition of crayons, in the same view as the ale wort, where only a small addition of cohesive power was required to be added to the solid bodies which formed them. But it is only in such cases it can be of any avail, as the ale wort, or others of greater efficacy, are in most cases wanted.

Oatmeal, or rather the decoction of it, made, as in the case of water-gruel, and strained, has likewise been employed for the same end as milk, and answers well enough in the case of the deep Prussian blue, indigo, and such bodies as are apt to dry gummy; because, though the decoction of oatmeal gives only a small degree of cohesion, yet it prevents that coalescence from the attraction of the parts of those bodies on each other which produces this brittleness.

Olive oil, as likewise the linseed, have been used to give the crayons a more flaky and chalky texture, by dipping into it, after they have been duly heated, such as are made of plaister of Paris, or tobacco-pipe-clay, in order to soften them, and remove that unkindly cohesion which prevents the sticking freely on the paper.

Wax has been also used by some in the light of a great improvement as a binder to crayons. The pretended utility of it is, that it will render the crayons so tenacious and fix on the cartoon as not only to be secure from shaking off by any concussion, but even to bear the rubbing with a brush. This quality does not, however, compensate for the great defect all such crayons will be found to have; which is, that they cannot make any of those delicate touches and finishings that give the merit to crayon painting. On which account they can only be employed for coarse purposes, and are consequently of very little consequence to painting in those cases where crayons have advantages over other methods.

I shall here give some general instructions for the compounding crayons of the several colours and tints; but at the same time must leave it to the discretion of the operator to adjust the exact proportion of the binders or glutens by actual trial, as the substances used vary too much in the degrees of their qualities in different parcels to admit of any standard proportion being given.

OF WHITE CRAYONS.

For forming white crayons for common purposes, chalk in its natural state is superior to any composition. It should be chosen white, pure, and of the most cohering texture; and it must be cut first into squares by means of small saws made for this use, of three inches length, and a quarter of an inch in thickness, and afterwards formed into a proper pencil-shape by taking off the corners with a pen-knife, and duly sloping the point.

Where an extraordinary degree of whiteness is required, a crayon may be made from flake white as prepared by the colourmen. It must be well powdered and moistened with milk to the consistence of a paste, and then formed in the pencil-shape and dried, but without heat, as that would tend to injure the whiteness, by changing the colour of the flake in the same manner as in the production of masticot. If the crayon thus made appears to want tenacity, it must be worked over again with a fresh quantity of milk; or a little gum tragacanth may be added to the milk. This crayon, however, should not be used where chalk will be sufficiently bright; for all kinds of ceruse, as

I observed before, are subject to have their colour changed by accidents not easily to be guarded against.

OF RED CRAYONS.

For red crayons of the scarlet hue, vermilion and red lead may be used, with ale wort boiled, till it appear slightly glutinous to the touch, and further inspissated by the addition of gum tragacanth; the proportion of which may be a scruple to a pint of the thick wort. With this gluten, the vermilion, or red lead, must be reduced to the state of a paste, by grinding them together, and then formed into the proper shape, and dried with a gentle heat.

When the orange cast of red lead is not particularly wanted, it is safer to use vermilion; for though red lead will stand much better used this way than in oil, yet the vermilion is still more secure, as nothing can change it without a burning heat.

The paler crayons of the same colour may be made, by mixing washed chalk with any of these colours, which may be done in three proportions; the first with an equal weight of the chalk, the second with double the weight, and the third with treble. But if other teints are wanting, the proportion may be varied otherwise according to the occasion. These compositions should be formed in the manner above-mentioned, by means of ale wort inspissated by boiling; but the wort should be thicker where the quantity of the chalk is less, according to the three proportions; because, after it has been moistened, and is again dried, chalk has a considerable cohesion of itself.

The scarlet ochre gives a fouler red crayon, but yet very useful, if it be compounded with the ale wort inspissated both by boiling and the addition of gum tragacanth, in the proper manner directed for vermilion.

Scarlet ochre may likewise be formed by composition with chalk, into paler teints, in the same way as vermilion.

Common Indian red may be likewise treated in a parallel manner, and will give other teints of red.

Red ochre requires no composition; but if it be chosen pure, and of a good colour, will afford useful crayons by the same management as chalk.

Lake must be used for crimson crayons, and may be brought, when well ground with ale wort, to a proper texture; but if, as is the nature of some parcels, it appears too gummy, make it up with the decoction of oatmeal instead of the ale wort. It is proper to be very careful in the choice of lake for crayons; for, as it is very apt to fly when not properly prepared, the consequence in crayon painting is in such cases very bad, since it will much sooner change when used in that manner than in oil.

The paler tints of the lake must be produced by the admixture of several proportions of white, in the same manner as the foregoing colours. The white employed should not, nevertheless, be chalk, for the reasons before given; but pearl white, or plaister of Paris. I think the former much the best; but in the compounding it into crayons with the lake, a stronger binder is required than in the case of chalk. The ale wort should therefore be well inspissated by boiling for those crayons where the proportion of lake is greatest; but, for the others, it should be adequately rendered yet more viscid by the addition of gum tragacanth.

It would be extremely proper to have crayons of carmine, if the price did not make the use of it too expensive. Considering that circumstance, it is more expedient to use it rubbed in by the leather roller in the manner below directed, by which it may be conveniently laid on where it may be necessary.

A small crayon compounded of the best and most scarlet lake, with about a third part of carmine, should, however, not be wanting. They may be worked up with milk, and a little decoction of oatmeal, with a small proportion of gum tragacanth; but some carmine is sufficiently glutinous, and requires no binder, which ought therefore to be first tried before the binders are added.

Small crayons must likewise be made of carmine and pearl white in different proportions, and the ale wort must be more or less inspissated according to the quantity of white; but as the carmine differs greatly in different parcels as to its gummy consistence, this must be regulated by discretion.

Rose pink, when good, forms a crayon which has merit with regard to its beauty, if its defect in other respects did not forbid the use of it. It may be made into crayons.

without any composition, in the same manner as chalk, where it is of so firm a texture as it is commonly found to be; but where it happens to be of a looser, it must be brought to a proper state of cohesion by ale wort. It is, nevertheless, scarcely worth while to take the trouble of forming it any way into crayons, as the colour will always fly if the cold air have access to it, and it can, never, therefore, be prudently employed in paintings of any value.

OF BLUE CRAYONS.

For a deep blue crayon, the darkest Prussian blue may be formed into a crayon by grinding it with the decoction of oatmeal. If the tenacity be not sufficient, the ale wort must be added.

Indigo, when good, will likewise produce a deep blue crayon, with ale wort inspissated by boiling.

For paler blues, Prussian blue of different degrees of lightness may be used with ale wort; but the ale wort must be inspissated by boiling, or the addition of size or gum tragacanth in proportion to the lightness; the darker kinds of Prussian blue being of a more glutinous nature than the lighter.

Verditer will also make a good blue crayon, but it must be used with ale wort strongly inspissated.

Bice should likewise compose another crayon treated as verditer.

Crayons should likewise be formed of verditer, or bice, with chalk in different proportions, and compounded by means of the ale wort thickened by boiling.

Ultramarine being too dear to form crayons, should be used in the manner above directed for carmine.

OF YELLOW CRAYONS.

The prepared orpiment, or pigment called King's yellow, forms the brightest and fullest coloured yellow crayon; but the poisonous quality, and nauseous scent of it, are such faults as render it on the whole much inferior to that next mentioned.

The King's yellow may, however, be formed into a crayon with ale wort, inspissated by boiling and the addition of gum tragacanth, but it must be dried without any heat.

The turpeth mineral, well levigated and washed over, makes a very fine crayon, of a cool, but very bright yellow colour. It may be treated for this end exactly in the manner above directed for vermilion.

Dutch pink and English pink make crayons of a pretty good yellow colour, but are not so secure from flying as the two above-mentioned. When they are of a firm texture, they may be used as the chalk, without any other preparation than cutting them into a proper form; but where they are of a more soft and crumbly substance, they must be worked up with the inspissated ale wort.

Yellow ochre may also be formed into a crayon in the same manner as chalk, or it may be ground and washed over, and then used with the inspissated ale wort.

More diluted tints of yellow may be procured by mixing chalk with any of the above-mentioned pigments, and forming them into crayons in the manner before-mentioned for the other colours.

OF GREEN CRAYONS.

The crystals of verdigrise, properly managed, make the brightest green crayon. They should be reduced to a very fine powder by grinding on the stone with spirit of wine, or oil of turpentine, and then formed into a paste by ale wort highly boiled, and inspissated still further by gum tragacanth; but as little fluid as possible should be employed in their composition. They should likewise be dried without heat.

Verdigrise will make a light blue green crayon, if treated in the same manner.

Prussian blue and turpeth mineral, compounded in different proportions, form almost a variety of good green crayons. They must be worked up with ale wort thickened by boiling.

Prussian blue and Dutch pink make likewise a pretty bright green crayon, being formed by means of the inspissated ale wort.

Verditer and turpeth mineral form a good pale green; but they require ale wort both thickened by boiling and the addition of gum tragacanth.

Blue bice and turpeth mineral, or Dutch pink, make another kind of light green crayon, being treated in the

same manner, except that when Dutch pink is employed the ale wort requires only to be well thickened by boiling.

Crayons may likewise be formed of any of the above-mentioned green pigments and chalk, by the means before directed with regard to the other colours.

OF ORANGE CRAYONS.

King's yellow, or turpeth mineral, with red lead, or vermilion, makes a bright orange crayon. They must be compounded with ale wort thickened, as well by gum tragacanth as boiling.

Orange crayons may likewise be formed from Dutch, or English pink, compounded with red lead, or vermilion; but the ale wort need not in this composition be so strongly inspissated as for the last.

Chalk may be added to either of these in different proportions, to vary the tints in the manner above directed for the rest; or good crayons of a paler orange, where brightness is not required, may be formed from Spanish annatto compounded with chalk, and worked up with ale wort slightly inspissated.

The Spanish annatto used alone, being levigated with oil of turpentine, and formed by the addition of the decoction of oatmeal used in the most sparing manner, makes likewise a very good crayon of the full orange colour.

But the preparation of this is more troublesome than those given above, which will in general answer the same purpose.

OF PURPLE CRAYONS.

A very bright purple crayon may be formed of deep Prussian blue and carmine, compounded by means of the decoction of oatmeal; but this being expensive, must be made small, and reserved only for those cases where great brightness is necessary.

Deep Prussian blue and lake, treated as the above, form a crayon next in brightness to the above.

For a less bright purple, indigo may be used in the place of the Prussian blue; but the tint will not be so deep, and

ale wort slightly inspissated may be used instead of the decoction of oatmeal.

For coarser purples, indigo may be compounded with vermilion; but they will be much paler than the above, and for this composition the ale wort must be well thickened by boiling, and a slight addition of gum tragacanth.

OF BROWN CRAYONS.

For forming a full brown crayon, neither inclining to the olive nor orange, mix brown ochre and bistre, and work them up with the ale wort inspissated moderately by boiling.

Spanish brown, umbre, and the common and true Indian red, may likewise be compounded in the same manner with bistre into crayons of different tints of brown; and ivory black may be added, where necessary, to darken them and increase the variety.

Spanish brown and umbre may be likewise formed alone into brown crayons, by means of the ale wort inspissated by boiling, and a small addition of gum tragacanth.

For diluted browns calcined fuller's earth may be employed, either alone, or mixt with chalk in different proportions. The crayons must be formed by means of ale wort moderately inspissated by boiling.

Diluted browns may likewise be formed by adding chalk to any of the above compositions for browns.

OF BLACK AND GREY CRAYONS.

Black crayons may be formed out of pieces of charcoal well burnt, by cutting them into a proper shape in the manner directed for chalk. The kind of charcoal, said to be the best for this purpose, is that made from the wood of the willow.

Good black crayons may likewise be formed of ivory black, mixt with a little very deep Prussian blue or indigo. It must be worked up by ale wort, boiled thick with a small addition of glover's size.

Green crayons may be formed of the ivory or lamp black, mixt with chalk in different proportions, and com-

pounded, by means of ale wort well inspissated by boiling.

The carmine, ultramarine, or any other colour which may be too dear, or not had in sufficient quantity to form crayons, may be used by means of the leather roll above-mentioned. This roll is only a piece of shammy leather formed into a kind of long cone, by rolling it in a spiral manner, and then twining thread tightly round it to keep it from unfolding. The leather must be so managed in the rolling as to form a point of the degree of bluntness required, or if it be too blunt it may be sharpened with a penknife. With the point of this roll breathed upon, the carmine, &c. may be taken and laid on the painting in such touches as may be required, and the effect will be nearly the same as if the point of a caryon had been used. This roll will likewise be found useful in *sweetening* (as it is called) the colours, by rubbing the edges of the teints together, where the surface is not large enough to admit the finger to do that office.

CHAP. VI.

Of the Grounds for the several kinds of Painting.

SECT. I.

Of the Grounds for Oil Painting.

THE substance or matter on which oil paintings are made, unless in very particular cases, are canvas, wood, or copperplate. The preparation or covering of these, in order to their receiving the proper colouring, must be therefore different, according to the different substance in question.

The pieces of canvas, prepared by proper primings, are then by painters called *cloths*, and are the most common grounds for oil painting. But these cloths, though they are dispensed with in general, because painters think it too much trouble to prime them themselves, and therefore make shift with what the colourmen will afford them; who, on their side likewise, consult nothing but the cheapest and easiest methods of despatching their work, are yet at present prepared in a faulty manner in several respects. In the first place, the whole covering is apt to peel and crack off from the cloth, by the improper texture of the under coat, which is formed of size and whitening, and is both too brittle and too little adhesive, either to the cloth or upper coat, to answer well the purpose. In the second place, the oil employed in the composition of any paint used on such grounds is extremely apt to be absorbed or sucked in by them, and consequently to leave the colours with which it was mixt destitute, in a great degree, of what is necessary for their proper temperament. This is called, though improperly, *the sinking in of the colours*, and is attended with several inconveniences; particularly, that the effect of the painting appears very imperfectly, while the colours are in this state and deprives the painter, as well as others, of the power of judging properly of the truth of the performance. It is indeed practised sometimes to varnish over the ground, which will prevent the sinking in; but there is a hazard in this, that the upper coat may leave the ground, and the painting consequently come off. Whoever, therefore, would have good cloths, free entirely from this disadvantage, must direct the preparation of them themselves, and they may produce them in perfection by the following means:

" Let the cloths be first well soaked with drying oil
 " laid on hot; and when nearly dry, let two or three coats
 " of drying oil and red ochre, mixed as thick as can be
 " worked, be spread over it. Then, the last being dry,
 " let the cloth be brushed over with hot drying oil, as
 " long as it appears to sink in; and, lastly, let it be co-
 " vered with a coat of white lead and oil, rendered grey, or
 " of any other colour desired, by admixture of the proper
 " pigments. This last coat may be polished to a due de-
 " gree by rubbing with a pumice stone, or by glazing it.

" with the glass polishers used for linen, and called *callender stones*."

In priming wood, or preparing it to receive the oil colours, the same errors are generally committed; for the method almost universally practised, is to clear coat (as it is called) with size and whitening, and then to cover it with white lead and oil. But the ill effects of such a method are still greater, in this case, than in that of canvas; since, if any moisture find access to the wood, the paint rises in blisters, which are liable to be burst, and to cause a flaking off, and peeling of the paint, in a very detrimental manner. For paintings of any value, the wood should, therefore, be brushed over with hot drying oil as long as it will soak in, and then covered with a coat of white lead, or flake, coloured according to what may be desired. Even in the case of house or coach painting, the clear-coating with size and whitening ought to be omitted; and, in its place, a coat of drying oil with some white lead and ochre, but not so much as to make it stiff, should be used as the first priming, instead of the size and whitening. This method would both preserve the wood much better, and prevent the blistering and peeling, and, in some degree, the sinking in of the colours that attend the common method.

When copperplates are used, there is no occasion for any other priming than one coat of oil and lead, or ochre, rendered of the colour desired; but such plates are seldom employed but for delicate and elaborate paintings. The surface of the priming ought to be made as smooth as the plate itself, by rubbing with the pumice-stone, or glazing with the callender-stone. But there is another method very effectual for making a fine ground on the copperplates, which is, the using flake white and fat oil, with any colour required; which being laid on the plates placed in an horizontal position to dry, will polish itself very highly by the running of the oil. The oil used for this purpose should be thoroughly fat; which, though not at present to be had of colourmen, may be easily made by the method below taught, with very little expence and trouble. This method of producing grounds by fat oil, perfectly smooth, secured from any sinking in of the colours, and in all other respects much better than any other, may be practised with advantage on cloths or wood, as well as copperplates, the

cloths being first prepared for the last coat in the manner before directed, and the wood soaked with drying oil.

SECT. II.

Of the Grounds for Painting in Water Colours, or premature Painting.

THE substance on which paintings with water colours are usually made, are cartoon paper, (or a kind designed for this purpose) common paper, or vellum, and ivory.

When paper of any proper kind is used, it is sufficient to prime it with isinglass, size thickened properly with pearl white, and any pigment which will afford the colour the ground is desired to be. But common paper may be rendered stronger and fitter to receive the colours by laying on the back of it a coat of starch boiled with water to a moderate consistence, and rendered yet more tenacious by the addition of a little isinglass. This should be laid on very smoothly with a brush; and the paper, when near dry, must be put betwixt the leaves of a book, or betwixt two sheets of paper and two boards, and compressed by a weight laid on the books or boards. Two sheets of paper cemented together by the starch and isinglass, and treated in the same manner, make a very commodious substance for painting in miniature. It has been advised to pounce paper designed for painting with water colours, or to rub them over with alum water. But as the intention of this is only to guard against the defect of paper that will not take ink, or other aqueous fluids, without running, it is much better to avoid the use of all such paper; for the pounce prevents the colours working freely with the pencil, and the alum water changes several of the colours; as for example, the litmus, and archal, if used, would be turned to a red from blue or purple.

Vellum has been likewise directed to be pounced by some of those who have pretended to teach the best methods of managing water colours. But, if it be good, it requires no other preparation than the straining on a paste-board, or other such proper body, and priming it in the manner directed for paper; and if it should happen to be

greasy, the rubbing it over with the gall of any beast will remedy the defect, without the inconvenience produced by the use of pounce. The straining the vellum on the pasteboard must be effected by cementing them together with the starch prepared as above, or with isinglass, which is better for this purpose. The vellum must be also cut so much bigger than the pasteboard that it may lap over on every side; in the doing which, care must be taken that it be equally stretched on each side, so as to render the whole perfectly even.

When ivory is used as a ground, it must be first rubbed over with the juice of garlic, and then stained by any washing colour of the teint desired as a ground, if any other be preferred to white.

SECT. III.

Of the Grounds for Painting in Distemper.

THE substance or matter on which paintings in distemper are generally made, are canvas or wood.

When canvas is used, as for scenes, &c. it must be coated with strong size and whiting till it be of a thickness to take a water polish, and then it should be primed with plaister of Paris free from lime, and mixed up with size, as before directed for the plaister, as it will then bear lake, carmine, or other colours prepared from vegetables, without preying upon, or changing them. The manner of giving the water polish is by rubbing over the ground with a wet cloth till it be perfectly smooth.

When wood is used, it should be first brushed over several times with thin size; or, in case the surface be not quite smooth, with strong size and plaister of Paris, to fill up the inequalities or holes, if there be any.

SECT. IV.

Of the Ground for Painting in Fresco.

THE ground for painting in fresco is stucco, which may be laid floated and prepared in the usual manner that stucco is treated. But no more must be laid at

one time that can be painted before it be dry; because afterwards the colours, which have no vehicle in this kind of painting but water, will not cohere with the ground after it be once dry. As this ground can be completely prepared by the common workmen in stucco, it seems needless at present to give a more minute description here.

SECT. V.

Of the Grounds for varnish Painting.

THE substance or matter on which varnish paintings are made, is, for the most part, copper, iron, and wood. As the painting ground is not covered with the colours in most works of this kind, it must consequently be of the varnish itself the work consists of. But where it is intended to be painted over, as in the case of regular pictures, a priming may be given of shell or seed-lac varnish, mixed with the proper colours for the ground desired.

CHAP. VII.

Of the Methods of varnishing and preserving Pictures and Paintings.

THE method of preserving paintings in oil, is, by coating them with some transparent and hard substance, as a varnish, to secure the colours from the injuries of the air or moisture, and to defend the surface from scratches or any damages the painting might receive from slight violences.

The substances that have been, or may be used for this purpose, are gum Arabic, glair or whites of eggs, isinglass size, and varnishes formed of gum resins, dissolved in spirit of wine, or oil of turpentine; which last, where oil of turpentine is used, are called oil varnishes.

Gum Arabic has been used, dissolved in water, as a varnish for pictures and paintings, on account of its being both more easily laid on and taken off than the varnishes formed of spirit of wine, or oil of turpentine. It is more easily laid on, because it may be made exactly of that degree of viscosity with which it can be best worked with a brush or pencil; and because it is totally free from that accident called *chilling*, which attends all varnish made with spirit of wine. There is, however, along with these, another quality of so bad a kind that its effects more than countervail these advantages in the use of gum Arabic as a varnish for paintings; this is, that, as it dries, it is extremely apt to crack, and give such appearance of flaws and scratches as obscure and deform the painting to an intolerable degree, and therefore this gum is at present much rejected with respect to its application, and the substance we shall next consider substituted in its place. The addition of sugar, or sugar-candy, will greatly prevent the cracking of gum Arabic; but then it gives a viscosity or stickiness to the gum that makes the face of the painting sully, and is in a manner equally detrimental with the cracking of the gum.

Glair of eggs, beat to an unctuous consistence, and spread with a proper brush over the paintings, answers much the same end as gum Arabic; but has the like advantages with much less of the bad quality of cracking; for which reason it is generally preferred to that gum. It has, nevertheless, one great defect, which is its not lasting, for it requires to be renewed frequently, as either moisture or great dryness of the air injure it. It is usual to mix a little brandy or spirit of wine with the glair of the eggs, in order to make it work more freely with a brush; as also a lump of sugar to give it more body, and prevent its cracking; from which after all, it will not be entirely free, after it has some time laid on, if the picture be put into a very dry place.

Isinglass size may be used for a varnish in the same manner as the solution of gum Arabic, or the glair of eggs; and if a little honey of sugar, about a fourth or fifth of the weight of the isinglass be added to it, it will cover more effectually than either of them, and yet be free from cracking. This is not, however, so lasting a varnish as the gum resins, especially if the painting or picture be

brought into a damp situation; and indeed, in all cases, it is apt to turn very yellow with time. But where there is a prospect of having occasion to take off the varnish for altering the painting, this will be found a very good one, as it may be entirely removed by means of a sponge and hot water.

There have been many compositions invented for spirit and oil varnishes for paintings; but the multiplying number of ingredients in such compositions is by no means attended with advantages that are equivalent to the trouble. I will, however, give one of the applauded recipes of each kind; and then subjoin to it another more simple, which I believe will better answer the purpose.

“Take of gum sandarac half a pound, of Venice turpentine one ounce and a half, of the gums animi and copal, each three quarters of an ounce, of mastic half an ounce, of Benjamin, gum elemi, and white resin, each two drams, of rectified spirit of wine one pound. Powder the Benjamin and gum animi, and put to them and the Venice turpentine, contained in a proper sized phial, eight ounces of the spirit of wine. To the copal and resin powdered, put, in like manner in a phial, six ounces; and to the powdered gum elemi two ounces. Let them stand, shaking the phials frequently, till the gums, &c. be dissolved. Then strain all the solutions through a piece of fine linen into one bottle; and after the mixture has stood some days, decant off as much as will separate clear, and keep it in a bottle well stopp’d for use.”

Some omit the copal, which is in fact so much the same with the animi that there is no certain mark of distinction known, and put in its place the same quantity of gum sarcocol; but it is not of any consequence which is admitted, or whether three parts in four of the ingredients be rejected, for the following will answer the end equally well.

“Take of the gums mastic and sandarac, powdered grossly, each six ounces, of Venice turpentine half an ounce; dissolve them in a quart of highly-rectified spirit of wine, and strain off the solution as the above. If this be wanted harder, an equal weight of the gums animi or copal may be added, and the quantity of spirit of wine doubled.”

In the using this kind of varnish, great care must be taken that the picture receive no damage from it; for the dissolving power of the spirit of wine will sometimes reach the oil of the painting, and consequently disturb the colours.

The varnish should therefore be spread with as little and as gentle work of the pencil as possible; and care should be taken likewise that the painting be thoroughly dry before the operation be attempted. There is also another nice circumstance to be attended to in the use of this kind of varnish, which is, to avoid what is called *the chilling of it*. This will certainly happen, if the varnish be not laid on in a very warm place, or the picture itself warmed to a moderate degree; and it will be still more liable to happen, if the spirit of wine employed be not very highly rectified. If the varnish appear to be *chilled*, (that is, when the parts of the gums do not attract each other, but precipitate from the phlegm, left by the spirit on its evaporating away, in the form of a powder, which gives a misty turbid appearance to the surface, instead of a transparent shining one) another coat should be laid over it, which will in general remedy the mischief. Indeed less than two or three coats of this kind of varnish is not sufficient to preserve the painting, and bring out a due effect of the colours, if they are in that state called *sunk in*, occasioned by the attraction of the cloth on the oils mixed with them.

The following is a recipe for an oil of turpentine varnish of the more compound kind.

“ Take of the gums mastic and sandarac, each four
 “ ounces, of white resin two ounces, of the gums sarcocol,
 “ animi, copal, and olibanum, each one ounce. Powder
 “ them grossly, and put them into a phial with two pounds
 “ of oil of turpentine. Stop the phial, but not too fast
 “ lest it burst, and place it in any heat, the greater the
 “ better, under that which will make it boil. Let it stand
 “ there till the gums be dissolved; or at least so much of
 “ them as will be dissolved; then strain off the solution
 “ for use.”

The ingredients, except the mastic and sandarac, may be omitted at discretion; and with respect to the gums animi and copal, under which names a variety of gums brought from the East and West Indies, as well as Africa

pass, there are a very few parcels which will be found to dissolve in oil of turpentine. Indeed I have never found any that would be so dissolved; but recipes like this have been given upon very good authority. The following therefore will be found a much cheaper, less troublesome, and equally good varnish with that made with this complex mixture.

“Take of gum sandarac two ounces, of mastic and olibanum each an ounce and half; or three ounces of mastic, and Venice turpentine half an ounce; powder them, and dissolve them in half a pound of oil of turpentine, proceeding as in the above.”

When this kind of varnish is used, it is particularly necessary that the painting should be thoroughly dry, and the pencil used as gently and sparingly in the laying it on as possible: for the oil of turpentine is extremely ready to dissolve the oil of the painting, if it be the least within its power; on which account the varnishes of this sort are much less used now than formerly. This varnish, however, will spread much more easily than that with spirit of wine, and is not subject to chill, even though it be laid on without the aid of any warmth. But it is proper, nevertheless, to be very careful that there be no damp or moisture on the surface of the painting, which would prevent the varnish from taking hold, and wholly frustrate the intention of it.

Varnishes have been used, likewise, formed of the gums sandarac, olibanum, and Arabic, with white resin and turpentine, dissolved in linseed oil, but they are greatly out of use now; as such varnishes are slow in drying, and the linseed oil will turn yellow, besides the disadvantage arising from the impracticability of ever taking them off the painting again, whatever occasion there may be for it. But a very secure and good varnish may, nevertheless, be made by dissolving two ounces of sandarac and olibanum, with half an ounce of Venice turpentine, in half a pound of oil nut or poppy oil that is white; and if too fat for other use, the better.

All these varnishes must be carefully laid on with a pencil or brush, according to the circumstances before intimated to be proper for each kind. But with respect to those made of spirit of wine, or oil of turpentine, particular care must be taken not to pass the pencil or brush more

than once over the same place ; for, otherwise, it will produce streaks and inequalities, which spoil the effect.

Paintings in miniature are preserved by means of plates of glass, or the talc, called isinglass, placed in the frame before them. There is no particular method to be observed in doing this, but to make the frame so compact that the air may have no access, which otherwise will sometimes prey upon the colours.

Paintings in distemper, where they are of consequence enough to merit such care, may be rendered more durable and preserved from foulness, by varnishing them with hog size boiled to a strong consistence, in which a fifteenth or twentieth part of honey has been dissolved.

Paintings in fresco, being designed to bear the inclemency of the air and weather, are calculated, from the nature of the colours and grounds, to preserve themselves without any protection or means of security.

Paintings in varnish require no means of preservation but from violence ; the varnish itself being a very sufficient defence of the colours against the air, moisture, or all other substances that might affect them.

Crayons must be preserved as paintings with water colours, by plates of glass or isinglass. There have been many experiments made to discover a method of varnishing and giving adhesion to the colours, to prevent their being so easily rubbed off, or indeed shaken off, with any very brisk motion.

There are several methods of fixing crayons now practised, one of which is said to be that of M. La Tour, the famous French painter in crayons. But all these methods are at present kept as close secrets in the hands of persons who practise them. None of them, however, go much farther than to prevent the colours from being shaken off by the concussion of carriages, or other accidents that may shake the place where they are hung. The same may be done by various easy means ; as nothing more is required than to commix some tenacious body with the colour, either during the time of painting, or after they are laid on. The method hitherto most pursued, has been by spreading some fluid oil varnish, such as has been mentioned before for the preservation of oil pictures, on the back of the cartoon, or paper, on which the crayon painting is made, after it is finished. But this must be done

with great care as to the proportion, otherwise the tints of the painting will be changed by some of them growing darker, in-consequence of their being rendered in a small degree transparent. Another method is to lay such a varnish, or nut oil a little inspissated by some of the same varnishes, on that side of the cartoon, or paper, which is to be painted upon, before the painting be begun; which, when dry, will hold the colours in a very considerable manner. But the painting must, in this case, be finished before the varnish or oil grow dry, otherwise the intention will be defeated. By practice and experience either of these methods may be made to answer in a considerable degree.

CHAP. VIII.

Of mending and cleaning Pictures and Paintings.

SECT. I.

Of mending Pictures.

WHERE pictures have been torn, or parts of them destroyed, various methods have been used for repairing them, and making good the damaged or defective parts. But there is one simple method, by means of the oil fattened together with the colours in what is called by painters the smush-pot, or vessel where they rub off the paint from the pencils, and put the scrapings of the palette, which, employed in the following manner, effectually answers the end, at least equally well with the most complex and elaborate method.

Where pictures are only cut or torn without any loss of their substance, they should be laid on a flat even board or table. The torn or divided parts being carefully put together with some of the matter of the smush-pot laid as

a cement, in and over the joint, they must be kept in that situation till this cement be thoroughly dry. The rising or inequality of the cementing matter with the surface must be then taken off neatly by means of a penknife, and the part afterwards properly coloured to correspond with the picture.

Where the cloth is worn out in parts, or destroyed by any accidents, the defective places may be easily made good by the following manner: Having laid the picture on a flat board, cut out with a penknife such jagged or damaged pieces as cannot be brought to lie smooth and even. Then form a piece of canvas bigger than the hole intended to be covered, and plaister it over with the above-mentioned fat oil and colours taken from the smush-pot, on the outside of the cloth, and fit it properly as a patch to the place it is to make good, taking care that the margin, or that part which projects on every side of the hole, have good hold of the canvas of the picture, and be pressed close every where to it: Then let it remain till it be thoroughly dry, and fill afterwards the inequality, or sinking of that part of the picture where the patch lies, with the same matter from the smush pot, raising it somewhat higher than the surface of the picture, to allow for the drying; and if it rise too high, when dry, take it down with a penknife. After this is perfectly dry also, the part may be painted according to what the picture requires, and it will be found to be equally sound and durable with any other part.

Where a picture is cut or torn into several pieces, the parts of it may be joined together and cemented down in the proper places on a piece of fresh canvas, by the same means.

SECT. II.

Of cleaning Pictures and Paintings.

THE art of cleaning pictures and paintings is of great consequence to the preserving valuable works of that kind, but has been very little understood even by those who profess to practise it. On this account many very valuable pictures have been damaged; and indeed few escape without damage, in a greater or less degree, which

come under the hands of those who pretend to make it their business, and yet most generally know no other than one single way of treating all the subjects they are to operate upon, however different may be the condition or circumstances of them.

As a painting may be, however, fouled with a variety of different kinds of matter, many of which will not be dissolved, or suffer their texture to be destroyed by the same substances, it is necessary to know what will dissolve or corrode each such kind. For there is no other means of removing or taking off any foulness, than by dissolving or corroding, by some proper menstruum, the matter which constitutes it, except by actual violence, which the tender nature of oil paintings by no means suffers them to bear. Of these substances, which will remove, by dissolving or corroding it, the matter which may foul paintings, some are very apt, likewise, to act upon and dissolve the oil in the painting itself, and consequently to disorder or bring off the colours. While others are, on the contrary, passive and innocent, with respect to the painting, and may be used freely, or indeed in any quantity whatever, without the least inconvenience of this kind.

As paintings to be cleaned are likewise varnished with a variety of substances of different natures, which sometimes require to be taken off, and at other times are much better left remaining, it is very necessary to be able to judge what is best to be done in this point. It is likewise requisite to know the means by which each sort of varnish may be taken off without injury to the painting. For in fact, without this, there is no way of cleaning pictures in some circumstances, but by scouring till as well the surface of the picture as the foulness be cleared away. I shall therefore first give some account of the nature of the substances, which are, or may be used for cleaning paintings in oil, and then shew how it regards this application of them; and then shew how they may be used as well for the taking off the varnish as for removing any foulness that may lie either upon or under it.

The first, and most general substance used for cleaning pictures, is water. This will remove many kinds of glutinous bodies, and foulness arising from them; such as sugar, honey, glue, and many others; and also take off any varnish of gum Arabic, glair of eggs, or isinglass, and is

therefore the greatest instrument in this work. It may be used without any caution with regard to the colours; as it will not in the least affect the oil which holds them together.

Olive oil, or butter, though not applied to this purpose, through an ignorance of their efficacy, will remove many of those spots or foulness which resist even soap, as they will dissolve or corrode pitch, resin, and other bodies of a like kind, that otherwise require spirit of wine and oil of turpentine, which endanger the painting; and they may be used very freely, not having the least effect on the oil of the painting.

Wood-ashes, or what will better answer the purpose, when used in a proper proportion, pearl-ashes, being melted in water, make a proper dissolvent for most kinds of matter which foul paintings. But they must be used with great discretion, as they will touch or corrode the oil of the painting, if there be no varnish of the gum resins over it, so as to render the colours liable to be injured by very little rubbing. The use of them, or soap, is however, in many cases, unavoidable; and in general they are the only substances employed for this purpose.

Soap is much of the same nature with the last-mentioned substances, being indeed only oil incorporated with salts of the same kinds, rendered more powerfully dissolved by means of quick-lime. For which reason it is something more efficacious, but consequently more hazardous, as will the sooner get hold of the oil of the paintings. It should therefore, not be used but on particular spots that elude all other methods, and there with great caution.

Spirit of wine, as it will dissolve all the gums and gum resins, except gum Arabic, is very necessary for the taking off from pictures varnishes composed of such substances, but it corrodes also the oils of the paintings, and softens them in such manner as makes all rubbing dangerous while they are under its influence.

Oil of turpentine will likewise dissolve some of the gums used for varnish; but spirit of wine will in general much better answer that purpose. There are, however, sometimes spots of foulness, which will give way to spirit of turpentine, that resist most other substances used in this intention, and it may therefore be tried where they appear

to fall, but very sparingly and with great caution, as it will very soon act even on the dry oil of the painting.

Essence of lemons has the same powers as oil of turpentine: but is, moreover, a much stronger dissolvent, and should, therefore, only be used in desperate cases, where spots seem indelible with regard to all other methods. Spirit of lavender and rosemary, and other essential oils, have the same dissolving qualities as essence of lemons; but they are in general dearer, and some of them too powerful to be trusted near the colours.

Whenever paintings are varnished with gum Arabio, glair of eggs, or isinglass, the varnish should be taken off when they are to be cleaned. This may be easily distinguished by wetting any part of the painting, which will feel clammy if varnished with any substance dissolvable in water. In such cases, the taking off the varnish will frequently alone render the painting entirely clean; for if it has been laid on thick, and covered the surface every where, the foulness must necessarily lie upon it. The manner of taking off this kind of varnish must be done by means of hot water and a sponge, the picture or painting being laid horizontally. The water may be near boiling hot, and may be used copiously at first with the sponge; but when the varnish appears to be softened, and the painting more naked, it should be used cooler. If the varnish adhere so as not to be easily brought off by a sponge, a gentle rubbing with a linen cloth may be used, the cloth being frequently wrung and wet again with fresh water a little warmish.

Where paintings appear by the above trial to be varnished with the gum resins, or such substances as cannot be dissolved in water, it is proper, nevertheless, to wash them well with water pretty warm by means of a sponge, which will sometimes be alone sufficient to clean them even in this case. But if there yet appear any foulness, rub the painting over with olive oil made warm, or butter; and if any parts appear smeary, or any foulness seem to mix with the oil or butter, pursue the rubbing gently, taking off the foul oil, and adding fresh till all such foulness be wholly removed. Let the oil be then wiped off with a woollen cloth, and if the picture require further cleaning, the wood-ashes, or pearl-ashes, must be used in the follow-

ing manner; which, indeed, as to the first part, is not widely different from the method commonly used.

“ Take an ounce of pearl-ashes, and dissolve them in a pint of water, or take two pounds of wood-ashes, and add to them three quarts of water, and stir them well in the water once or twice in an hour for half a day. Then, when the earthy part of the ashes has subsided, pour off the clear fluid, and evaporate it to a quart, or if it appear acrid to the taste at that time, three pints may be left. Wash, by means of sponge, the painting well with either of these solutions, or lyes (which are in fact the same thing) made warm, and rub any particular spots of foulness gently with a linen cloth till they disappear; but if they are found to remain unchanged by the lye, do not endeavour to take them off by mere force of rubbing, for that would infallibly damage the colours under the spots before they could be removed; for in this case they should be left to be tried by the spirit of wine, or the essential oils of turpentine and lemons. Where thick spots seem to give way in part, but yet resist in a great degree to this lye, a little strong soap-suds may in some cases be used, if with great caution. But it should be prevented as much as possible from touching any part of the painting, except the spot itself; and, as that disappears, the soap should be diluted with water, that it may not reach the oil of the colours in its full strength. If, however, all this be done upon a strong coat of varnish, there will be less hazard; and, in such cases, the washing freely with the wood ash lye, or weak soap-suds, will frequently do the business effectually without any material damage. But it requires some judgment to know where paintings may be so freely treated; and, with respect to those of great value, it is always best to proceed by more circumspiced methods, and to try the more secure means I have above directed, before these rougher be used.”

Some use the wood-ashes with the addition of water only, without separating the solution of the salts from the earth; which, when so used, assists in rubbing off the foulness from the painting. But all such practices are to be condemned, as the finer touches of the painting are always damaged in a greater or less degree where any abraded force is employed in cleaning it.

Where spots appear after the use of all the above-mentioned methods, spirit of wine, or, if that fail, oil of turpentine, and in the further case of its default, essence of lemons must be applied. The spots should be lightly moistened with them, avoiding to suffer them to touch any more of the surface than what is covered with the foulness, and the part should be immediately rubbed with a linen-cloth, but very gently, observing at the same time to desist if the colours appear the least affected. After a little rubbing, olive oil should be put on the spot where oil of turpentine and essence of lemons are used, and water where spirit of wine is applied, which being taken off by a woollen cloth, if the foulness be not wholly removed, but appears to give way, the operation must be repeated till it be entirely removed.

Where paintings appear to have been varnished with those substance that will not dissolve in water, and after the careful use of the above means still to retain the foulness, or where, as is very often found, the turbidness, or want of transparency, or the yellow colour of the varnish deprave the painting so as to destroy its value, such varnish must be taken off. The doing of this, though attended with the greatest difficulty to those who proceed by the methods now in use, and which indeed is seldom done by them at all, but with the destruction of the more delicate tints and touches of the painting, is yet very easily and safely practicable by the following method.

“Place the picture or painting in a horizontal situation, and moisten or rather flood, by means of a sponge, the surface with very strong rectified spirit of wine; but all rubbing, more than is necessary to spread the spirit over the whole surface, must be avoided. Keep the painting thus moistened by adding fresh quantities of the spirit for some minutes; then flood the whole surface copiously with cold water, with which likewise the spirit and such part of the varnish as it has dissolved may be washed off. But in this state of it, all rubbing, and the slightest violence on the surface of the painting, would be very detrimental. When the painting is dry, this operation must be repeated at discretion, till the whole of the varnish be taken off.”

In pictures and paintings which have been long varnished, it will be found sometimes that the varnish has been a

composition of linseed oil, or some other substantial oil, with gums and resin. If such paintings cannot be brought to a tolerable state by any of the above-mentioned means, which may in this case be freely used, the mischief may be deemed to be without remedy; for it is absolutely impracticable to take off such a varnish, as it is more compact and indissoluble than the oil of the painting itself, and could only be wrought upon by those menstrua and solvents which would act more forcibly on the paintings. Such pictures must, therefore, be left in the state they are found, except by being freed from any foulness that may lie upon this varnish, and may be cleared away by the methods we have before directed. The coat of this varnish may indeed be sometimes made thinner, by anointing the surface of the painting with essence of lemons, and then putting on olive oil, which, when rubbed off by a soft woollen cloth, will carry away the essence with such part of the varnish as it may have dissolved. But this requires great nicety, and can never be practised without some hazard of disordering the colours of the painting.

CHAP. IX.

Of the Nature, Preparation, and Use of the several Substances employed in Encaustic Painting.

SECT. I.

Of the general Nature of Encaustic Painting.

THE manner of painting called at present ENCAUSTIC, differs from all others in this particular, that wax is always employed in it as a binder to the colours, being united with them by means of heat applied in such a degree as will melt it.

The name of *encaustic* was given to this method of painting, on the supposition of its being the same with that practised by the ancients, when they are said *encausto pingere*; and there is some foundation from several passages in Pliny for such a notion.

This manner of painting has been lately attempted by several methods. In that first adopted, the wax was mixed with oil of turpentine, and sometimes other ingredients, and the composition was used as a vehicle for laying on the colours. This method appeared of very little use, and experience has since shewn that it answered the purpose much better, either to lay the wax on the ground, and paint upon it afterwards with the colours in water, or to lay the wax on the back of the cloth or cartoon, either before or after the painting was made upon it. In all these methods, after the painting is made, the picture is to be exposed to such a degree of heat as will melt the wax, that it may be diffused through all the particles of the colours, and bind them to the ground as well as secure them from the access of air or moisture. The last method has been applied as well to paintings with crayons as with water, but the crayons must be accommodated in their composition to this purpose.

Many advantages and conveniences, as well with regard to the easy practice as durability, have been ascribed to this method of painting by those who are favourers of it. But it has not yet prevailed in common practice, partly from the backwardness of professors of arts of this kind have to take the pains, or lose the time necessary to gain a facility or perfection in the execution of new methods, and partly from the increased difficulties and trouble arising from several circumstances of finishing a picture completely in this way.

SECT. II.

Of the Grounds used in Encaustic Painting.

THE grounds used for encaustic painting have been very different, and indeed should be so for different purposes. They have had for their basis, *canvas*, *linen cloth*, *paper*, *plaster*, and *wood*, and almost all these have been differently prepared.

According to the method of Count Caylas, who first introduced this manner of painting, the cloth, or wood, which were the substances he made the basis of his grounds, were to be simply rubbed over with a piece of bees wax, the surface of the cloth or wood being either in a perpendicular or horizontal situation, near a fire that would melt the wax so as to make it adhere; if the case of cloth, it was previously fixed to a proper straining frame; but when he used colours, on this ground, that were tempered with water, it was found necessary, in order to make them adhere sufficiently till the picture was finished, and the wax exposed to the melting heat, to rub the whole wax ground over with Spanish chalk or whiting.

According to the method directed by Mr. Muntz, who has written a treatise on this manner of painting since that published by Count Caylas, and who appears to have rendered it more practicable by the improvements he has made, the ground, when the painting is on cloth, is to be thus prepared.

“ Take any kind of linen cloth, which is of a close texture, soft and even, and extend it on a straining frame, as is done in the case of cloths used for oil painting. Lay it on a smooth table, with that side downwards on which the colours are to be laid. Let it be then rubbed several times over with a piece of common bees wax, or virgins wax, till it appear that the cloth be equally covered with a coat of wax of a considerable thickness. If the linen be fine, this is all that is requisite to prepare it for being painted upon; but if it is coarse, it must be turned with the side uppermost that is to receive the colours; or, in other words, the reverse of the waxed side, and the surface must be well, but gently, rubbed with a pumice-stone, to take off all the knots and unevenness, which might prevent the free and accurate working of the pencil. In the preparation of a cloth for this kind of painting, regard must be had to the preventing any of the waxed part of it from touching the straining frame when the picture is finished. In order to this, the cloth, when the wax is laid on, should be strained on a frame of the magnitude of which the picture is intended to be; and so much cloth should be left beyond the outward edge as will be sufficient to strain it on a larger frame, that will admit the wax

"part to be a little within its inner edges after the picture is finished. If this be not done, the wood touching the wax, at the time it is melted, would imbibe a part of it; and consequently robbing the colours, render so much of the picture imperfect."

This method can, nevertheless, only be applied to cloth or paper, where the wax can pass through the substance. Therefore, in the case of wood, stone, metal, or plaister, the former method of Count Caylas must be adhered to. It succeeds, indeed, extremely well with regard to plaister, on account of the gritty or rough substance; only, in this case, the dead colouring must be painted first, and the colours fixed by melting the wax before the finishing be begun; and then either chalk must be used, as at first, to make the colours adhere, or the colours themselves must be tempered with oil of turpentine and a little wax. When wood, stone, or metals are used, this roughness of surface being wanting, it must be supplied artificially, by laying a ground of equal parts of chalk and wax, and fixing them; and then the painting may be performed as well as upon cloth. When paper is used, it requires the aid of a smooth board, or a plate of copper, or some other metal. This board, or plate, must be first well coated with wax, in the same manner as was above directed for the cloth; and then the paper must be fastened upon it by the corners. Paper thus prepared may be painted upon by colours tempered in water, and, when the picture is finished, they may be mixed by melting the wax as in the foregoing cases. The same may be done with a cloth and a board, or a plate of metal, where that may be thought more convenient than waxing the back of the cloth.

In the case of crayons, there are two methods of forming grounds proposed by Mr. Muntz. The one is with cloth without paper. The other with cloth covered with paper.—The first is in this manner.

"Take any kind of linen cloth, of which the texture is close and even, and stretch it on a straining frame.
 "Rub the back of it with a piece of bees wax, using heat, as in the manner above directed. The cloth being thus waxed, prepare any tint or colour, that is thought best to work upon, by mixing some proper pigment with an equal quantity of chalk, and tempering them with water. With this composition, paint over the cloth on

" the side that is to be the ground of the picture, or, in
 " other words, the reverse of the waxed side, laying an
 " even and thick coat of the colour proper for the ground.
 " When this colour is dry, bring the picture near the fire,
 " as in the other before-mentioned cases, and melt the
 " wax; which will then pass through the cloth and fix
 " the ground. This, when cool, will be found a very
 " firm and good body to work upon with the crayons.
 " If, however, it should happen that the quantity of wax
 " should not be sufficient for the body of the colour, a
 " fresh quantity must be supplied by another coat on the
 " reverse or back; but as this must be laid on without
 " heat, the wax should be dissolved in oil of turpentine,
 " and applied with a brush as directed below, and the
 " canvas must afterwards be again exposed to such heat
 " as will melt the wax, that this fresh quantity may pass
 " through the cloth, and be absorbed by the colour. This
 " must be cautiously managed, as it is of great importance
 " in crayon painting to have the ground in good order to
 " receive the colours of the pastils."

The other method of forming a ground for crayons is
 in this manner of painting, that is, where cloth and paper
 are joined together, is thus performed:

" Take linen cloth, and stretch it upon a straining frame
 " in the manner above directed. Make then a paste with
 " fine wheaten flour, or starch and water. When the
 " paste is almost sufficiently boiled, add to it, of common
 " turpentine, such a quantity, as will be, in proportion to
 " the paste, about a twelfth part of the weight. Stir the
 " composition well together, and let it simmer over the
 " fire five or six minutes. Take it then off the fire, and
 " let it stand to cool a little. After which, before it be
 " quite cold, paste the paper to the cloth with it in the
 " common method, and leave them to dry. In the mean
 " time, dissolve some wax in oil of turpentine, by adding
 " the wax in shavings to the oil, and placing the mixture
 " near a fire. The proportion of the one to the other
 " must be such, that the composition, when cold, will be
 " of the consistence of a thin paste, but yet so fluid as to
 " admit of being spread by a brush. The cloth and paper
 " being perfectly dry, hold them over, or before a fire, at
 " a convenient distance; and, with a brush, lay a coat of
 " the wax and turpentine on both sides the conjoined cloth

"and paper, in such a degree of thickness that both surfaces may shine in every part, without the appearance of any dull spots. This being done, place the cloth before the fire for about half an hour, or, if in summer, expose it to the sun. By this means the oil of turpentine evaporating, the wax will become solid again, and be fit to receive any composition of colour for a ground to paint upon; which ground must be laid on and fixt, according to the directions above given in the case of cloth without paper."

These are the grounds which have been used for all the several methods hitherto invented and communicated to the public. The greatest part of them are not merely grounds to receive the painting, but previous deposits of the wax on the cloth, paper, &c. in order to its being commixt with the colour, by means of a melting heat, when the picture is finished; as, according to several of the methods, the wax could not be conveyed to them afterwards.

SECT. III.

Of the Colours to be used in Encaustic Painting.

ALMOST every colour admitted in oil painting may be used in the encaustic method, as practised in Mr. Muntz's manner, except some few, that by their gummy or stony texture will not suffer such a cohesion with the wax as will properly fix them. In this light, Mr. Muntz excepts to brown, and light pink, and unburnt *terra di Sienna*. But, besides those, which may be trusted with safety in oil, there are some which may be allowed here, that cannot be admitted in oil painting. These are, red lead, red orpiment, crystals of verdigrise, and red precipitate of mercury; which, on account of their brightness, are very advantageous where they can be used. In short, whatever colours are of such texture that they may be used commodiously, and with good effect, in relation to the painting, may have a place here; as the wax, inclosing every particle of them, and consequently preventing all access of air and moisture to them, renders them perfectly durable. The colours which dissolve in water, or when ground in it, suffer a cohesion of their particles, and grow

hard on again becoming dry, or palpably unfit, as they resist the imbibing the wax and its commixture with them. Excluding all these, there is, nevertheless, a great latitude of choice, and, indeed, in a very ample provision of colours, even of the first degree of brightness, which this manner of painting allows, a very great part of its merit consists.

As many of the colours grow deeper on their being fixed with the wax than they were before, or even than when they are moistened with water, allowance must be made in the painting for such change. In order to facilitate this Mr. Muntz has proposed the expedient of making a standard, or regulator, in the following manner.

“ Take two pieces of linen cloth, of about a foot in length, and three or four inches in width, and wax them as above directed. On one of them paint all the simple colours on the unwaxed side in successive space lengthwise, of about an inch each in breadth. On the other piece, paint the compound teints; and mark them with numbers according to their order and gradation, making a memorandum in writing on a piece of paper of what simple colours, and the respective proportion each tint is formed. When the colours are dry, cut the cloths lengthwise into two equal parts, and fix the colours on one part of each of them, by exposing it to the proper degree of heat, for melting the wax, in the manner below directed. By comparing the pieces when the colours are fixed with those where they are unfixed the difference will of course appear, which the wax produces on the colours; and by this standard of it, due allowance may be made, in the using the colours, for the change that is to happen after the fixing.”

It is a great advantage to the effect, to use a great body of colour, which not only renders the tint stronger and brighter, but prevents their varying unequally after fixing, from the undue commixture of the wax with the colours.

The colours are to be ground very fine in water, and then preserved of a due degree of moistness for painting by water only. For no other vehicle it to be added; gum, size, or any other substance that would give cohesion to the particles of the colours, would prevent the wax from commixing duly with them. This exclusion of all

unctuous or sily vehicle is one of the greatest disadvantages attending this method of painting. For, though Mr. Muntz says, *you may give greater freedom to the pencil, and blend and sweeten the colours better in this way of painting than any other*, yet it is obvious, that many of the colours will not kindly work in water, nor indeed any, but such as commix intimately with it, and thicken the water by their own substance; and these coalescing again, when dry, refuse the admission of the wax, and are therefore exceptionable, as was before mentioned.

In order to retouch any larger parts of the painting, which may require it, after the colours are dry, this method must be practised.

“ Take a large soft hair pencil, and moisten gently with water those places which are to be repainted; and then what is necessary may be done, as well as when the colours were originally wet. But great care must be observed not to use so much violence as may ruffle or displace the colours, which are very loose in this state, as they have no glutinous vehicle to bind and fix them. In larger pictures, where the cloth is stronger, the colours may be moistened by brushing the backside of them with water, which, notwithstanding the wax, will find its way through. But this must be done gradually and sparingly as to the quantity of water, or otherwise the colours may be rendered too wet, and the painting disordered. In very delicate paintings, the use of the steam of water is safer than the brush, care being taken to keep the painting so far distant from the heat of the water as not to melt the wax.”

SECT. IV.

Of the manner of fixing the Colours in the practice of Painting in Encaustic.

THE picture being finished, and the colours dry, prepare a clear coal fire, and set the picture with the painted side towards it, at about two feet distant from this fire. Let it grow warm, and then by degrees bring it closer to the fire, till it be only one foot distant, but never advance it nearer. The picture may be held perpendicularly, or a little inclined, as may be found most conveni-

ent, and when it is too large to receive the effect of the heat at once, first one part, and then the other, may be brought, parallel to the fire at the distance prescribed. When no farther change appears to be made in the picture, but that the whole surface is shining, and the colours rendered darker and fuller in an equal degree, it may be concluded the wax is sufficiently melted, and duly absorbed by the colours. The picture must then be removed from the fire in the same gradual manner it was made to approach it, and kept from any rude touch till the wax be entirely set and grown hard.

If there be found any defective parts where the wax has not undergone the due degree of heat required to melt it, such parts must be perfected, by bringing a red-hot poker, or other such metallic body near them. But if there still appear any spots, where, after the duly melting the wax to commix it with the colours, a deficiency of it is yet seen, such spots shew a defect in the quantity of wax, and the deficiency must be supplied by rubbing a proper quantity on the back, and melting it by means of the hot poker, or other proper implement of metal in the same manner.

SECT. V.

Of the manner of Painting with Crayons in Encaustic.

THE pastils, or crayons, used in encaustic painting, may be the same with those used in the common way of crayon painting, except that such as are too tenacious, in consequence of an over great proportion of any clayey body, or of any gummous or fizy substance, added to bind the colour, must be rejected. The best method, however, of distinguishing such crayons as are fit for encaustic painting, from such as are faulty with regard to it, is to make an actual trial of them on the proper ground prepared as above, and to fix them afterwards by heat, as before directed, by which means, with very little trouble, the imperfection, if there be any, will be immediately perceived in the real degree. When it is found that any crayons, which seem faulty in their texture, are nevertheless wanted on account of their colour to produce any particular teint, a proper variation must be made in the composition of them, and less of the clay or viscid matter added

to give the tenacity must be used. If the trial of the crayons be made on the proper ground in the manner before directed, p. 178, 179, for the encaustic painting with the pencil, a complete standard will be produced, for shewing the difference of the teints, before and after they are fixed, which is not less necessary in this kind of encaustic painting than in the other.

The manner of using the crayons in the encaustic way of painting is the same as in the common method of crayon painting, the difference of the one from the other lying only in the preparation of the ground;—the choice of crayons of a fit texture to receive the wax, as above-mentioned;—and the fixing the crayons after the painting is finished, by means of melting the wax, previously laid on the cloth, or ground, as in other encaustic painting.

The fixing the crayons may be performed exactly in the same manner as is directed page 183, in the case of encaustic painting with the pencil, the principles of both being entirely the same. If, moreover, there appear to be occasion to retouch after the fixing, it may be done as often as required, and wax dissolved in oil of turpentine may be each time applied to the back, and the picture again exposed to the due degree of heat, as in the other methods.

CHAP. X.

Of the Nature, Preparation, and Use of the several Substances employed in Enamel Painting.

SECT. I.

Of the general Nature of Enamel Painting.

ENAMEL painting differs from all other kinds, in the vehicle employed for the colours, (to hold the parts together, and bind them to the ground they are laid upon.)

This is glass, or some vitreous body, which being mixed with the colours, and fused or melted, by means of heat becomes fluid, and having incorporated with the colour in that state, forms, together with them, a hard mass when grown cold. It answers, therefore, the same end in this as oil, gum, gum water, size, or varnish, in the other kinds of painting.

The glass, or vitreous body, applied to this purpose of mixing with the colours, in order to bind them to the grounds, is called a *flux*, and makes one principal class of the substances used in enamel painting. When this flux is easily fusible, that is to say, melts with a less degree of heat, it is, in the style of those who work in enamel, said to be **SOFT**, and when it is reluctant to melt, and requires a greater degree of heat, it is called **HARD**. These terms are as well applied to the matter of the enamel grounds, and all other vitreous substances concerned, as to the fluxes. It is, in general, a perfection of the flux to be soft, or run easily into fusion. But the great point, with respect to this particular, is, that when several mixtures of colours and fluxes are used at the same time, they should all correspond to each other in the degree of this quality; otherwise some would be rendered too fluid, and perhaps run the matter of the enamel ground into fusion; and some with it, while others remained solid and insufficiently fused themselves. It is always necessary, likewise, that the enamel of the ground should be considerably harder than the mixtures for the colours, for if they both melt with the same degree of heat, they will necessarily run together.

It being requisite that the body painted in enamel should undergo a heat sufficient to melt *soft* glass, the matter of such body can only be gold, silver, copper, porcelain, or China ware, *hard* glass, and earthen ware. And where the metals are used, if the painting be of the nature of a picture, or demand a variety of colours, it is necessary that a ground of white, or some other colour should be laid on the metal, the body of which ground must necessarily be of the same vitreous nature as the flux, but harder; as nothing else can endure so great a heat that is capable of incorporating with, and binding the matter of the white, or other colour, to the surface of the metal. The grounds, therefore, make another principal class of the substances used in enamel painting.

The third class is the colours, which must likewise be bodies capable of suffering the heat of melted glass, and such as will either themselves be converted into glass, or kindly incorporate with it in a melted state. This of course confines the matter of such colours to metals, earths, or other mineral bodies, all vegetable and animal substances being calcined and analized with a greatly less degree of heat than the lowest sufficient to work enamel.

The fourth kind of substance is what I shall call the *secondary vehicle*, which is, some fluid body for laying on the ground, and working with the pencil the flux and colours when mixt together; since, as they form only a dry powder, they could not be used as paint without some such medium. But as this is to serve only for spreading and laying on the matter of the enamel, and not, like other vehicles to assist in holding the colours together, and binding them to the ground, (that being in this kind of painting the office of the flux) it is necessary that it should be some such substance as will evaporate and dry away without leaving any part behind, as it would otherwise be heterogeneous matter, with regard to the enamel, and consequently injurious to it. Essential oils have been therefore used for this purpose, as they have the quality of wholly drying away on the first approach of heat, together with a slight unctuousity, which renders them capable of making the matter of the enamel work properly with the pencil.

The preparation of these several substances have been, till late, greatly monopolized by the Venetians, except what were prepared at Dresden since the establishment of the China manufactures. The few others who have had any knowledge of this matter, have practised the preparing only some kinds; and even at present there are, perhaps, none in this country who make more than a small part of the variety necessary. For though many possess the knowledge of some particular articles, yet they are ignorant with regard to others, which are again, perhaps, known to those who are ignorant of these. As there has been hitherto no means afforded to the practisers of it of learning the particulars of this art in a system, and a deeper knowledge of the principles and practice of chymistry is requisite to the attaining it, without being taught, than could well fall to the share of painters, or rather artists; I

shall, therefore, be more minute in my instructions for the making the several kinds of the grounds, fluxes, and colours, in order that they who are concerned in, or may be desirous to apply themselves to the art of painting in enamel, which is now become the basis of a considerable manufacture in this country, may furnish themselves with whatever is necessary in its greatest perfection.

Besides the knowledge of the preparation of the above substances, and of that part of the art of using them, which belongs to painting in general, there is another requisite. This is the *burning*, as it is called, the grounds, in order to forming them on the body to be painted or enamelled as also the colours with the fluxes after they are laid on the grounds. What is meant by BURNING, is the giving such a heat to the matter, when laid on the body to be painted, as will fuse or melt it, and consequently give to the flux or vitreous part of the composition the proper qualities of a vehicle for binding the colours to the ground and holding the parts together. As this requires a particular apparatus, I shall endeavour to shew the method of constructing it in the most expedite and easy manner; and to give such cautions for the conduct of the operation both for burning the grounds and painting, as may be enable those, who are less experienced in it, to attain to perfection in this art. It cannot be expected, nevertheless, considering the nicety of the subject, such direction can be given as will insure success in the first trials, with regard to several of the processes, or even the general operations; but whoever will make themselves masters of the principles on which they depend, which are all alone intimated, will easily be able to correct their own errors.

A judgment, formed by some little experience, is likewise requisite for the preparing well the colours with certainty. For as different parcels of the same substance vary frequently in their qualities, with regard to the degree of proportion, it is necessary to make allowance accordingly in the proportion of the quantities in the mixture. This cannot be done till some little previous trial be made and the power of judging of them be gained by an experimental acquaintance with them. But as the materials in general are very cheap, and the experiments may be made in the same fire where actual business is done, whoever

would excel in the art of preparing and using enamels should take a considerable scope of experimental inquiry into the effect of all the various proportions and mixtures of the substances used.

SECT. II.

Of the Apparatus, or set of Utensils for the preparing and laying on the Grounds and Colours in Enamel Painting.

THE apparatus necessary for preparing and using the several substances employed in enamel painting, consists of a furnace for calcining and fusing the matter of which the colour is composed; as also for burning or fusing the grounds and colours after they are laid on;—of proper muffles or coffins for securing the enamelled paintings from the injury of the fire while they are burning;—of pots for fusing the compositions for colours and fluxes, or the mixtures of them together;—of crucibles for calcining copper and other metals, in order to the preparing the colours;—of mortars of glass, agate, or flint, or of stones, and mullars of porphyry or flint, for the pounding and levigating the several kinds of matter;—of tongs for taking the pots, muffles, &c. out of the fire;—of brushes, pencils, and a fine searce or sieve.

The furnaces for burning enamel are constructed of very various size or figure, according to the nature and qualities of the work; and some are made to be heated with common coal, and others with charcoal, but at present not frequently. The best form for a furnace for enamelling pictures, or other pieces of the same magnitude, where the despatch of great numbers are not wanted, is the following, which is made to work with a fixt muffle, in or out of which the work may be put or taken without opening the door of the furnace, and annoying the operator with the heat; who, for the same reason, likewise may conveniently inspect the work in the muffle.

The iron-work must be first prepared. It consists of a frame and bars, such as is described in p. 35, the area of which together must be ten inches by seven;—of a door and frame, such also as is described in p. 35, which must be five inches high, and seven long;—and of a plate or strong bar to lay over the opening of the front, as below di-

rected, which must be ten inches long ;—with another of the same magnitude to lay over the door and frame ;—and one of eight inches to lay over the vent into the chimney ;—and of a frame for bearing the fixt muffle. This frame must suit the figure of the muffle ; except, that it must be only three inches in depth, with the back part open, for the muffle to pass through it into the cavity of the furnace ; and that the plate which forms the bottom must project an inch and an half on each side, beyond the arch or covering, for the brickwork to have good hold of it. But this will be better understood by considering the form of this kind of muffle, as below described.

The iron-work being prepared, let a chimney of twelve or fourteen feet height be raised ; the cavity of which must be an area of seven or eight inches square, in the front wall of which chimney a hole must be left for admitting the smoke of the furnace. The hole must be so placed that the lower part may be five feet above the foundation of the chimney ; and it may be four inches high, and six long ; the plate prepared for this purpose being laid over to support the brick-work above it.

The chimney being raised to a proper height, let a pedestal or foundation to the furnace be built, by adding two walls to those of the chimney, so as to inclose an area fifteen inches in depth from the front, and eight inches wide ; the front being left open from the default of a fourth wall. This pedestal must be raised four feet and a half high ; and then the frame and bars for supporting the fuel, with their cross-bars, must be laid ; the furthest cross-bar being laid close to the back of the hollow area ; or, in other words, to the wall of the chimney. The plate or flat-bar must be also laid close to the outermost cross-bar of those for bearing the fuel, in order that the brick-work may be carried over the hollow area, and inclose the square cavity of the furnace entirely. The brick-work must be then raised six inches higher, in the same manner as before ; only the front must now be carried up, as well as the sides ; which, together with the wall of the chimney, forms a complete inclosed area for holding the fuel. But particular care must be taken in laying the first course of this brick-work, that the flat ends of the cross-bars, in which those designed to bear the fuel are fastened, be well secured by the bricks which lie over them. When the

cavity for holding the fuel is thus formed, the door and frame must be placed in their proper situation, and the brick-work must be carried up on the two sides to the level of the top of the frame; but, in the side most conveniently situated, the iron frame for bearing the muffle must be fixed in the raising this part of the brick-work. This frame must be placed about four inches higher than the bottom of the door, and two inches from the back or furthest part of the furnace; care being taken that the brick-work have good hold of the parts of the frame formed for that purpose. The bricks contiguous to the frame should be properly sloped to the hole formed by it, that the opening to the muffle may be wider and more commodious for taking out and putting in the work to be burnt, as also for the more easy inspection of it while burning. The brick-work being brought to a level with the top of the frame of the door, the plate or flat iron bar provided for that purpose must be laid over it, in order to support the building over it. The sides of the furnace must then be raised five inches higher, and the cavity or hollow covered with a dome of fire-stone, made a little concave on the upper or under side, and of any figure the stone will best suit on, the outward or upper. This dome must rest on the brick-work, and they should be so fitted to each other as to make as close a joint as possible; so that a coat of plaster being laid on the bricks when the dome is put up, the furnace may be perfectly tight. Windsor bricks should be employed for all that part of the furnace which is above the bars for bearing the fuel, and they should be made in Windsor loam.

Where greater quantities of pieces are to be enamelled, and despatch is required, furnaces must be built in the manner proper for containing coffins instead of a muffle; the constructing which the following is a very good method.

This furnace must be built till the fabric rise within two feet of the top of the door, in the same manner as the former, except with regard to the dimensions, and the building a back wall against that of the chimney, which must be eight inches in breadth, and twenty inches in height. The dimensions of the cavity of the chimney, it rises to the height of five feet ten inches, must be five inches in breadth, and seven or eight inches in

depth, from the front; and the hollow or area under the bars for bearing the fuel must be eleven inches and an half deep from the back wall to the front, and twelve inches wide; and that of the furnace where the fuel is to lie eight inches in depth from the front wall to the back wall and twelve inches in breadth; to which dimensions the bars and cross-bars must be suited. The building being carried up to the height here mentioned, a door and frame of the same form with that for feeding the fire, must be fixt in the most convenient side of the furnace; the intention of which door is to serve for putting in and taking out the coffins; and it must therefore be placed so, that one end of the frame may be close to the chimney. The dimensions of this door must be ten inches in height, and eight in breadth. Then the brick-work of the chimney may be proceeded with in the same manner as before; except that the back wall against the chimney must be raised no higher. But the space it would take, if carried higher, must be added to the cavity or hollow area of the furnace; the top of this wall serving as a support to the coffins, which are to be placed upon it. Two pieces of fire-stone, nevertheless, of ten inches length, and of the thickness of two inches square, must be put with the lower part fixed at about three inches distance in the brick-work from the wall of the furnace, that the coffins resting upon them, the flame and heat of the fire may pass under as well as over them, and heat every part equally. Two vents into the chimney must be likewise made close to each side-wall of the furnace, and may be placed at the height of two inches above the level of the top of this wall, and of the dimensions of four inches in breadth, and three inches height. When these several parts have been completed, and the whole fabric is raised fifteen inches above the level of this wall, a dome of fire-stone must be fitted to it in the same manner as was directed for the former furnace; only it is necessary, in this case, that though the inner under side be concave, the upper should be flat, for the coffins to stand upon it to heat before they be put into the furnace, to prevent their cracking from too sudden an effect of the fire.

It is sometimes practised to burn enamel on an hearth with charcoal, in order to which no apparatus is necessary but a proper hearth of fire-stone or bricks, and a fire

of brick, or some such other material, through which to pass the nozzle of the bellows to blow the fire without burning them.

The bellows for this purpose must be made in the manner of those used for chymical experiments, to work with a weight, and to be moved by the operator as he stands by the fire; but a very small pair of that kind will serve for this purpose.

Melting pots for fusing the fluxes or colours are indispensably necessary, the common crucibles being of too loose a texture to contain vitreous bodies when perfectly liquified. These melting pots are not to be purchased, but must be made for the express purpose. The proper materials are tobaccopipe-clay, or Sturbridge-clay, (which is much cheaper here) two parts, and crucibles ground to powder, (or, in default of them, fine sand) one part, which must be tempered with water, and well mixed together. The dimensions must be regulated by the quantity of matter to be fused, and the shape may be a little conical, rather deep than shallow, to form which a solid mould of wood should be procured for working them upon to bring them to a regular figure. When they are formed, they must be well dried, and then thoroughly baked before they be used.

Muffles, and where the quantity is great, coffins formed of the same matter, are requisite for the burning, as well the grounds, as paintings in enamel. The use of muffles is to preserve the enamel from being injured by the falling of the coals upon it, or by the smoke and fumes of the coal, which in many cases is very detrimental to the colours. The matter of which the muffles may be fabricated may be the same with that just now given for the melting pots, and they must be also dried and well baked before they be used. The form of the muffles may be of two kinds; the one, that commonly used for essays; the other, a close muffle fixed in the fire, which is a much more commodious method than the having them loose.

The shape of the common muffle is only a flat square piece bent into the form of an arch, of such dimensions, that, being laid over the enamel work to be burnt, it will cover it. These may be best made by spreading the matter, properly tempered, on a piece of wood, turned to make a round correspondent to the arch of the muffle, and

working it even on the outside by a knife, or other flat instrument, and it may be left on this mould, or round piece of wood, till it be moderately dry and firm. It is proper also to make a bottom to this kind of muffle, on which the plate may be laid; but this may be either a detached part, or joined to it. It is only a flat piece formed of the same substance, and of such a magnitude as to suffer the muffle to rest upon it every where; and, if loose, to have a margin of half an inch for the better taking it out of the fire; but, if fixt to the muffle, it need only be of the same extent with it.

The fixt muffle must be of the same general figure with the loose kind; but the bottom must be always a proper part of it and exactly of the size suitable to the extent of the arched part, without any margin.

The size of this kind of muffle must be adapted to the sort of enamel work to be burnt in them; the breadth should be such as will suffer the pieces to be easily put in and taken out, and the height of the arch, where the form of the pieces does not require it to be higher, should not be above two inches. The end of this arch within the fire must be closed up, so that when the muffle is passed through the iron frame in the side of the furnace made to support it, and the joint made good by fire-lute, the hollow or cavity of it may be entirely closed, except the mouth or opening on the outside of the furnace. The length of this kind of muffle should be sufficient to admit its passing five or six inches into the fire, and yet having a proper proportion remaining to project on the outside somewhat beyond the iron frame. But these proportions are to be adjusted by the room wanted. There must be a false bottom likewise made to this kind of muffle, which must fit the other bottom, so as to slide in and out of the muffle upon it; but it should be made of such length, that when it is thrust home into the muffle, a part of it may project, that proper hold may be always taken for drawing it out. The design of this false bottom is, that the enamel work to be burnt, being laid upon it, may be pushed into the muffle and taken out without that difficulty and hazard of injury which would otherwise result from the form of the muffle.

Coffins for burning larger quantities of enamel work may be made of the same matter with the above. They

figure of them may be that of square boxes, of the length, when intended for a furnace of the dimensions above given, of ten inches, of the breadth of six, and of the height of seven; which measures should include also the thickness of the substance of which they are formed. In the cavity of these boxes, little columns, or projecting parts, should be placed against the sides rising to half the height of the cavity, in order that a square plate or piece of the form and size of the area may be laid on them hollow, as a flooring to support a second range or layer of the enamel work; and a lid must be likewise fitted to rest in a proper groove made in the sides of the boxes or coffins, at the top of them, that the fire and smoke may be wholly excluded from the cavity.

Crucibles of proper sizes must likewise be had for calcining the metals; but as they are to be obtained every where easily, it is needless to say more of them.

Mortars for levigation must be likewise had of various sizes; they should be either of agate, flint, or glass; for those of iron, or copper, would be liable to deprave greatly many of the colours, and to these should be added a porphyry stone and mullar, marble being too soft to bear the attrition of many of the substances used in enamel, without imparting too much of its own substance in consequence of such abrasion.

Sieves or sieves of fine lawn must be also provided for sifting some of the levigated substances, as also for spreading the powdered enamel to form the grounds; they should be like those of the apothecaries and druggists, with a cover and under part for preventing that waste of the matter which attends the sifting in the open air.

Tongs, with points bended at right angles, must also be procured for taking out of the fire the crucibles and melting pots. An iron instrument, like a baker's peel, is likewise necessary where the coffins are used; the flat part must be something broader than the coffins, and of nearly the same length, and the handle should be about three feet in length.

To these must be added brushes, pencils, tiles, and other common implements of painting; but as they are to be had every where, and their structure is generally understood, it is not necessary to be more particular about them.

SECT. I.

Of the general Nature and Application of the Substances used in Enamel Painting, with their previous Preparation.

OF THE SUBSTANCES USED FOR FORMING FLUXES.

MINIUM, or red lead, is used as a fluxing body for forming the enamel for grounds, as also in compounding fluxes for the colours. It requires no preparation for these purposes, only it is proper it should be pure which may be known by the method before given, p. 56. This flux renders the enamel soft, but, producing some proportion of yellow colour, is not fit for all uses.

FIXT ALKALINE SALT of vegetables is sometimes used also in forming the mixture for enamel grounds, as likewise in some compositions of fluxes for the colours. It makes a less soft enamel than the lead, but is free from yellow, or any other colour, and therefore proper for some purposes.

BORAX is a salt of very peculiar qualities, among which is, that of promoting vitrification, and the fusion of any glass when vitrified, in a greater degree than any other substance known; on which account it is of the greatest consequence in forming fluxes for enamel. It requires, nevertheless, either to be previously calcined or brought to a vitreous state, which it suffers from the application of moderate heat alone; and it must also be finely powdered before it be mixed with other ingredients in fluxes. Its use is not much known in common practice, though of the greatest consequence to the art of enamelling; as not only a set of softer colours may be produced by the aid of it than can be otherwise had, but the degree of each may be brought to correspond, by the employing it in different proportions, according to the respective hardness of the other ingredients, which differs so much as not to be regulated justly by any other means.

COMMON SALT may also be used as a flux in enamelling, particularly where there is occasion for glazing, where, as it is extremely fluid, and free of tenacity when fused, as also less subject to crack than any other vitreous body, it is of great use; but for fluxes for grounds and

colours in enamel, it is not frequently necessary to multiply ingredients, as the above three substances may, when properly applied, sufficiently answer most purposes. The same reasoning extends to nitre and arsenic; which, though they have the qualities of fluxes, possess yet along with them such others, with respect to their effect on several of the substances that compose the colours, as renders the methods of using them difficult and complex.

OF THE SUBSTANCES USED FOR FORMING THE BODY
OF ENAMEL, OR FLUXES.

WHITE SAND is used as a body for the fluxes and grounds of enamel; it should be reduced previously to an impalpable powder, in order that it may be mixed more intimately with the other ingredients, which not only accelerates the vitrification, but renders the glass greatly more perfect. The kind of sand, proper for this purpose, is that brought from Lynn in Norfolk, and called by the name of that place.

FLINTS are used for the same purpose as the white sand, and it is proper to use them when that cannot be procured of the right kind. They require to be calcined before they are applied to any purpose of vitrification. This is to be done by putting them into any fire, and continuing them there till the whole substance becomes white, when they must be taken out, and, while of their full heat, immersed in cold water, and kept there for some time. By such treatment they will be rendered of a very brittle and calcarious texture, and very easy to be powdered, which must be done to a perfect degree for the reason above given. Where small quantities of the matter of any kind of enamel is to be prepared, calcined flints are preferable to sand, as they are much more easily reduced to an impalpable powder, and the trouble of the previous calcination is very little.

There is a sort of stone, which the French call *maillon*, that forms the upper crust, and lies round the free-stone in most quarries. This stone will lose its tenacity in a moderate fire, and, when calcined, runs much sooner into vitrification than either flints or sand. It is therefore, when it can be obtained, a better matter for the body of fluxes or soft enamel than either of the other; as it will, with

the same proportion of the fluxing ingredients, make a much softer flux: or it otherwise admits of the diminution of the proportion of some of them; which, for reasons we shall see below, is in certain cases an advantage.

OF THE SUBSTANCES USED FOR PRODUCING A
WHITE COLOUR IN ENAMEL, OR FOR FORMING
THE GROUNDS.

PUTTY, OR CALCINED TIN, is used as a body of colour for the enamel grounds. As tin is very troublesome in calcining, requiring a long continuance of fire, and to be spread into a very large surface, it is much the best way to procure it for the purposes of enamelling ready calcined, of those who make it their proper business to calcine it for the use of lapidaries, and other artists who use it; for they have large furnaces, fitly constructed for performing that operation in large quantities, and can consequently afford it much cheaper than it can be prepared in small quantities, besides the sparing the trouble. It must be demanded of them by the name of *putty*, and care must be taken that it be not sophisticated, which it seldom fails to be before it comes out of their hands for common purposes. The sophistication, which is generally by chalk lime, or some such white earth, may be thus distinguished. Put the putty into a crucible with some tallow or other grease, and give it the heat of fusion, or what is sufficient to melt it, supplying the grease in fresh quantities as it burns away, till the calcined tin appears to have regained its metallic state. Suffer then the remainder of the grease to burn away, and the chalk or earth, if any were mixed with it, will be found swimming on the surface of the metal, to which, however, the ashes of the grease must be supposed to have added some little quantity. There is nevertheless, another body with which the putty or calcined tin may be adulterated, that will not discover itself by this method of reduction of the tin. It is white lead, which in this manner of treatment, would run into fusion and mix with the tin, and could therefore not be distinguished from it. But it may be easily rendered perceptible by another manner of proceeding, which is, to take the putty suspected to be adulterated with it, and having put it into a crucible, without any admixture, and inverted another

crucible over it as a cover, to give it a moderate heat, carefully avoiding that the smoke or coal of the fire may have any access to it to change its colour. If there be any white lead mixed with the putty, it will shew itself when removed from the fire, and become cold in a yellow or brown colour. If no such colour supervene, but the putty appear equally white as before it was heated, a conclusion may be safely made that it was not adulterated with white lead, or that, if sophisticated at all, it must be by some white earth, which may be made perceptible by the reduction of tin in the manner before-mentioned.

Where a very pure white is wanted for enamel, the easiest and best method is to calcine the tin by means of nitre, which may be thus done.

“Take half a pound of saltpetre, and put it into a melting-pot, such as is described p. 193; and put it into a fire to melt. When it is melted, throw in gradually ten ounces, or half a pound of tin filings, which should be rasped as fine as possible; but give time for the explosion that will follow, to cease betwixt each quantity that is thrown in, stirring; however, the matter in the mean time with the end of a tobacco pipe. After the whole is put into a melting pot, stir it again well about for some time, and then take it out of the fire, pouring all the matter out of the pot that can be got from it by that means, and then soak the pot in water till the remainder be soft enough to be scraped from it; taking great care not to let any part of the substance of the pot be commixed with the calcined matter. That which is moistened, in order to be got out of the pot must be dried and put to the other, and the whole well pounded, and kept stopt up in a bottle for use. There is no occasion for edulcoration, or washing the salts from the calx for this purpose, because they are by no means detrimental, but rather advantageous to the enamel.”

ANTIMONY has been also applied to the same use as tin; but the expence and trouble of reducing it to a calx, which must be by deflagrating it with nitre, renders the use of tin much more expedient. Morret, in his notes of Neri, recommends equal parts of the antimony and nitre; but as that proportion does not calcine the antimony to whiteness, but produces the *crocus metallorum*, or liver of

antimony, which is of a foul orange or reddish yellow colour, it is by no means sufficient. He says likewise, that regulus of antimony will answer the same end; but in this he is still further mistaken; for the regulus, which is a metallic body, in some degree malleable, could never be reduced to powder, as he directs all the ingredients in the composition he prescribes to be; nor if it were, would it form a white body on the fusion with the other matter.

When antimony is used for the colouring white enamel, it should be previously calcined by means of nitre, in the following manner.

“ Take of antimony one part, saltpetre three parts. Powder them well together, and then throw it, by a spoonful at a time, into a crucible heated red hot, waiting betwixt each time till the explosion the mixture will make, be entirely over. When the whole matter is put into a crucible, and has remained some time in a quiet state, take it out of the fire, and proceed in all respects as was above directed for the tin, when calcined in this manner.”

The calx of antimony so produced will be of a finer white than the calx of tin can be easily brought to, unless by this method of calcination, and therefore more fit for purposes where great purity of colour is wanted, either in grounds or painting. But as the tin prepared in the same manner may be rendered very white, it will be less expensive, as it requires less nitre to calcine it, and produces a much greater proportion of calx than the antimony.

ARSENIC is also used for forming a white colour in enamel; but it is a very nice matter to manage it well, as it is very soon changed by the heat into a transparent body, being itself a strong flux, and it is therefore much better to omit the use of it, unless for some particular purposes, in the state of white glass, as I shall below have occasion to mention. Arsenic is also used as a flux; but its effects on some colours renders it not very safe without great knowledge of its qualities, and caution in its application.

OF THE SUBSTANCES USED FOR PRODUCING RED, BLUE, YELLOW, &c. COLOURS IN ENAMEL.

ULTRAMARINE (the preparation of which we have before given) is used in enamel where very bright blues of a lighter tint are wanted; and sometimes, indeed, in other cases, by those who do not understand the right use of zaffer and smalt. But, there are few instances where zaffer, when perfectly good, fluxed with borax and a little calcined flint, or Venetian glass, to take off the fusible quality of the borax, will not equally well answer with the best ultramarine. The ultramarine requires no preparation, when used in enamel painting; previously to its being mixt with the proper flux; and what relates to its general qualities, and the means of distinguishing its goodness or genuineness, we have, along with its preparation before taught, p. 69, and the following.

ULTRAMARINE ASHES are used where light semi-transparent blues are wanted. But they are so frequently adulterated with precipitations of copper, which, of course, turn green on fluxing, that it is very necessary to be cautious in the use of any parcel not previously tried.

ZAFFER is used for produced blue, green, purple, and black colours in enamel. It is an earth obtained by calcining a kind of stone, called *cobalt*; and when it is mixed with any kind of vitreous bodies, it vitrifies, and at the same time assumes a strong blue colour, but, for the most part, verging to the purple. It is to be had, in a state proper for use, of those colourmen who make it their particular business to supply the glassmakers with colours. The goodness of zaffer can scarcely be known but by an actual trial of it, and comparing the effect of it with that of some other known to be good, and used in the same proportion.

MAGNESIA is an earth which, when fluxed with any vitreous body, produces a broken crimson, or foul rose colour. It is to be had, prepared fit for use, except a more perfect levigation, from those who sell colours to the glassmakers. It is useful not only for some purposes of red, but for several compositions for black, purple, and some browns.

The goodness of magnesia must be determined by the same means as that of zaffer,

SMALT is, as before-mentioned, zaffer vitrified with proper additions, which are generally fixt alkaline salts and sand, or calcined flints, and is sometimes used in a blue in enamel. But, being hard, it requires, for such purposes, to be used with a flux; which increasing the body of glass in too great a proportion for the tinge, is apt to dilute the colour too much, where great force is wanted; and therefore the use of the zaffer itself is in most cases preferable. There have nevertheless been, as was above observed, some parcels of smalt, or vitrified calx of cobalt, brought from Saxony, which are of an extreme strong body of colour, and will bear any proportion of flux necessary to render them as soft as may be required, without weakening the colour too much for any purpose. Common salt, however, ground very fine, and mixt with a fourth part of its weight of boraz, (which is much the most powerful and kindly flux for zaffer) will run pretty well, and may be used where either a full colour is not demanded, or where the work will admit of the colours being laid on thick. The goodness of smalt may be judged of by its bright and deep colour, and the less it inclines to the purple, the better. In order to judge of the strength of the colour, the smalt should be reduced to a fine powder; for, in a grosser state, every degree of fineness renders it so different, that a judgment cannot be easily formed of it. Smalt is to be had of all colourmen, and is not subject to any adulterations, which would not be obvious on inspection.

GOLD is used in enamel to produce a crimson or ruby colour, which, by the mistaken sense of the Latin word *purpureus*, has been called *purple* by all the English and French writers. It must be previously reduced to the state of a precipitated powder, by dissolving in *aqua regia*, and making a precipitation by means of tin, fixt alkaline salt, or some other metallic or alkaline body. There have been several methods used for the making this precipitate of gold, but the following will answer the end certain, when the process is duly conducted; but the success depends on such nice principles that it is very difficult to succeed to the utmost degree of perfection.

" Take of pure spirit of nitre eight ounces ; add to it
 " of *sal Ammoniacus*, scraped perfectly clean, and powder-
 " ed, two ounces ; which will convert the spirit of nitre
 " to *aqua regia*. Dissolve, in four ounces of this *aqua*
 " *regia*, put into a proper phial, half an ounce of purified
 " gold, in the state it is to be had of the refiners, under
 " the name of *grain gold*. In order to hasten this solu-
 " tion, the phial may be put into a gentle heat, where
 " it must continue till the gold entirely disappear. Take,
 " in the mean time, about the same quantity of *aqua regia*
 " in another phial, and put it into filings or small bits of
 " pure block tin, so long as any brisk effervescence arise
 " on the adding fresh quantities ; but this must be done
 " gradually, especially if the filings be used ; otherwise
 " the mixture will heat so much as to boil over, or break
 " the phial ; drop then thirty or forty drops of the solu-
 " tion of the gold into a half-pint glass of water, and
 " immediately after about fifteen or twenty drops in the
 " solution of tin. The gold will then be precipitated in
 " a red powder from the solution in the *aqua regia* drop-
 " ped into the water ; and this operation must be repeated
 " till the whole quantity of the solution be thus treated.
 " When the last quantity of the red powder has been
 " precipitated, pour off the clear fluid, and fill the glass
 " with spring water ; which, when the red powder has
 " settled, must be poured off likewise. Hold then a
 " sponge wet, but well squeezed, to the surface of the
 " fluid remaining with the powder ; and when as much
 " of the water as can be conveniently separated from it,
 " by that means, is drawn off, lay the powder on a marble
 " or porphyry stone to dry, taking great care that it con-
 " tract no dust or foulness."

This powder is the *gold purple*, or *precipitate of gold* ; and
 is now fit to be commixt with the proper flux. If the pro-
 cess succeed, it will, by this preparation, be of a fine crim-
 son colour, and perfectly answer the purposes of enamel
 painting.

Instead of using the solution of tin to precipitate the
 gold, the crude tin is most frequently employed ; but the
 precariousness of this method, which requires much more
 attention than that above given, overbalances the trouble
 of making the solution. For, if the solution be mixed
 with as much water in this method as in the other, it is

very slowly acted upon by the tin; and if it be not diluted with so much water, it forms a gelatinous body, when strongly saturated with the tin, which can never be separated from the precipitated gold, but by means that are destructive to its qualities as an enamel colour. When the crude tin is used, however, the solution must be diluted with about treble its quantity of water; and the tin must not be longer continued in it than while the gold appears to continue to form a red powder on the surface of it, on its being freed from that which before adhered to it. It is better, nevertheless, on the whole, to use the two solutions, as it is more easy to preserve a scarlet colour by that means; for, if the tin be too long continued in the mixture, it gives the colour a tendency to the purple. When a red colour is wanted, which verges greatly on the purple, a precipitation of the gold should be made by means of any fixt alkaline salt. Which may be thus done.

“ Take the solution of gold in *aqua regia*, as before directed, and drop in it a solution of salt of tartar which must be made by melting half an ounce of salt of tartar in a quarter of a pint of water) so long as there appear any effervescence or ebullition on the surface ther addition. Let the precipitated powder then settle, and proceed as was above directed for the *calx cassii*, or precipitation with tin. The powder thus produced is called *aurum fulminans*, from its quality of exploding when exposed to a moderate heat; which must therefore be carefully guarded against in the use of it, by keeping it out of the reach of any such heat till it be mixed with the flux for enamelling; and it will be the less hazardous, from being thoroughly well freed from the salt, formed in its production, by washing.”

The gold may be likewise precipitated in the same manner by volatile salts; in which case the volatile salt in the proportion of half the weight of the *aqua regia* may be dissolved in four times its own weight of water. But this method does not produce so scarlet a red in the gold precipitation as that of using the solution of tin, as before directed.

This precipitation may be also made by mercury dissolved in *aqua regia*; and it is said that a finer colour is produced by this method than with tin; as likewise, that

of the *aurum fulminans*, or any of the other precipitations, be fused with common sulphur, they will be rendered of a much brighter red; but the sulphur must in this case be suffered to burn away. These methods, nevertheless, are attended with much more difficulty and hazard than the simple method first given; and, perhaps, unless by accident, not to be commanded, will not produce a better pigment for enamel painting.

Besides the application of gold to form a red colour, it is used to produce the effect of gilding in enamel; for which purpose it must be reduced to the state of a powder by precipitation, or mechanical preparation.

The gold precipitate which is found to answer this purpose best, in the case of gilding glass, is that prepared by means of volatile salt as above; but as this requires greater heat than can be admitted in the case of enamel, it is proper to employ those which are made by metallic substances. The precipitate, which mostly retains the lustre of the gold, is that made by means of a solution of green vitriol or copperas in this manner.

"Take a solution of gold in *aqua regia*, prepared as above directed; and add to it gradually a solution of green vitriol or copperas in water, till it appear that no further precipitation of the gold be made, on adding a fresh quantity. The solution of the copperas may be made by putting one dram of it powdered into an ounce of water, and shaking them till the whole appear to be dissolved. After which the solution must stand, and the clear part be poured off from the sediment, if any be found. The fluid must be poured off from the precipitated gold, as soon as it is perfectly subsided; and the precipitation must be well washed, by pouring on it several successive quantities of water. Roman or blue vitriol may be employed for this purpose instead of the green, but it is somewhat dearer, and has no advantage over the other. The gold precipitate thus obtained is very bright and shining. A similar kind may be prepared by putting flat bars or plates of copper into the solution of the gold in *aqua regia*; but the precipitate is of a brown colour, without any lustre or shining appearance."

SILVER is used for producing a yellow colour in enamel. It must be previously reduced to the state of a powder,

which may be done either by precipitation from spirit of nitre, or by calcination with sulphur. The precipitation of silver from spirit of nitre, may be performed by dissolving an ounce of silver in two or three ounces of spirit of nitre, and precipitating and edulcorating it exactly in the same manner as was above directed for precipitating the gold from *aqua regia*, by means of copper for gilding in enamel. A precipitation may otherwise be made by pouring brine on the solution of silver in the spirit of nitre but I think the other method preferable. The calcination of silver with sulphur may be thus performed.

“ Put plates of silver into a crucible, with as much of the flowers of sulphur betwixt them as will cover the surface of each plate, and then place the crucible in fire that will heat it red hot. When it is thus heated take it out of the fire, and the silver will be friable or brittle, and must be reduced to a fine powder in a mortar of glass, agate, or flint. The calcination may be otherways made by mixing filings of silver with flowers of sulphur, in the proportion of one ounce of the silver to half an ounce of the sulphur, and heating them red hot in a crucible; or the sulphur may be thrown into the crucible after the silver is already made red hot.”

COPPER is used in enamel painting for the forming green, blue, and red colours; but it must be previously either calcined or reduced to the state of a powder by precipitation. The calcination may be performed by means of sulphur, in the same manner as is above directed for silver. It requires a strong fire for two hours, when the copper will be found converted into a blackish red powder, which must be well levigated by grinding and sifting. The copper so prepared, is called *ferretto of Spain*. It may be otherwise calcined, by stratifying it, in the same manner, with Roman vitriol; but a much longer continuance of fire is required in this method; and Neri says, it ought to be six times repeated to have the *ferretto* perfectly fine. When all this is done, nevertheless, the substance produced cannot be really different, notwithstanding the intimation of Neri to the contrary, from that of copper calcined with sulphur, if the quantity of sulphur employed be small, and the time of the calcination well adjusted. This must be judged of by the goodness of the *ferretto* when prepared; the criterion or mark of which is its a

appearing red when levigated. For, if it verge to the black, or purple, either the calcination has been too long continued, or the proportion of sulphur employed was too great.

Instead of crude copper, the kind of latten, called by artificers in metals *assidue*, may be used; but as the plates of it are too thin to be treated in the way of stratification, or layers, as the quantity of sulphur used would be much too great a proportion, it is better to clip the assidue with scissars into small shreds, and mix it by that means with the flowers of sulphur; and the extreme thinness of the plates, in this case, renders the necessary time of calcination very short.

Copper or brass in thin plates, latten, or assidue, may be otherwise calcined without sulphur, by exposing them to a strong heat for a considerable time. But as soon as the heat has rendered them friable, or brittle enough to bear levigation, it is the best way to powder the matter, and place it again in the fire thinly spread on a tile, or other such convenient thing, stirring it sometimes, that every part may be exposed to the open heat. By this means, the calcination may be much accelerated. A due regard should be had likewise in this case to the red colour of the calcined matter, as well as in the case of that calcined with sulphur.

But, notwithstanding, that it is requisite for many purposes to have the copper calcined only to a state of redness, yet it may be expedient, likewise, for some particular uses, to prepare other quantities with a higher calcination. This must be continued till the copper appear of a dark purplish grey, or light black, when powdered, though it must yet retain some tinge of the red; for if the calcination be pushed beyond that point, the *calx* becomes very difficult to be fluxed, and does not afford any colour in a kindly manner to the enamel.

The other method of reducing copper to an impalpable powder, is by *precipitation*; to which end the copper must be dissolved in any acid, (for all will dissolve it) and precipitated, by adding a solution of pearl-ashes in water, in the same manner as was directed p. 82, for making the kind of verditer called *sanders blue*, except in the use of starch, which must be here omitted. For making green

colours in enamel, this will be found preferable to the calcined copper.

To avoid the trouble of dissolving the copper, as above advised, Roman vitriol, which is only a combination of copper with oil of vitriol, may be used in the place of such solution. It must be previously dissolved, by adding hot water to it in a powdered state, and then the copper may be precipitated, by means of pearl-ashes, in the same manner as from any other solution of it.

IRON is used to produce an orange red, or foul scarlet colour in enamel, as also a transparent yellow, and to assist likewise in the formation of greens and other compound colours. It is prepared many ways, both by corrosion and precipitation; some of which indeed make a real difference, but most of them lead to the same end. The only difference, in fact, is this: When the iron is highly calcined, and freed in a great degree, not only from all acid, but even its own sulphur, the appearance of the crude calx will verge most upon a purple colour, and produce a foul purple enamel, if compounded only with a quantity of flux not sufficient to vitrify it; but though, when compounded with a greater quantity of flux, it will vitrify into a transparent yellow, somewhat inclined to the red. But when it is less, or not at all calcined, and retains its own sulphur, or perhaps some proportion of acid used in the preparation, it will in proportion be yellow, or verge towards the yellow, when used with the less proportion of flux, and produce a cooler or less red yellow, when used with a quantity sufficient to vitrify it. Instead of using the crude iron in these preparations where it is to be precipitated or calcined, it is much better to use common green vitriol, which consists only of iron and the acid of vitriol; from whence consequently the iron may be obtained in the state to which these preparations lead by easier and less expensive means than when used crude. But the preparation of the rust, formed by vinegar, requires the iron itself; and, if found necessary, is, nevertheless, the only instance where the precipitated basis of vitriol will not answer the same end as the iron.

The first preparation of iron is, therefore, the rust by corrosion with vinegar, which may be thus made.

“ Take of iron filings any quantity, the finer they are
“ the less trouble they will give in the preparation, and

"sprinkle them with vinegar, rubbing them together after it is added, that every part may be moistened equally. Spread them in any cool place, where they may be free from dust, on a board or paper, and let them remain there till the moisture appear to be dried away, and then try if they be so corroded as to bear powdering. If they be found to be brought to a state that will admit this, it must be performed on a porphyry stone with a mullar, or in a glass or agate mortar. But if they appear not sufficiently corroded, they must again be moistened with vinegar, and laid out as before, and, when become fit, powdered in this manner. The powdered rust must then be sifted through a fine searce, and the grosser part, that will not pass, moistened again with the vinegar, which must be repeated till none of the iron, worth further notice, remain uncorroded. The whole must then again be levigated, till it be a perfectly impalpable powder, which will be then fit for use."

The iron, prepared thus by vinegar, is proper for making a transparent or glazing yellow in enamel, or for compounding with blues to form green colours. But this process is greatly more troublesome and laborious than those below given, and is attended with no benefit in the process, except that this rust will afford a cooler or less red yellow than the others, and may therefore be of advantage, in some particular cases, for forming very bright greens.

It has been used to calcine the rust, prepared thus with vinegar, to form what is called the *crocus martis*; but it is a very injudicious method of proceeding; because, where calcination is to be used, the vitriol, or the iron corroded by sulphur, are equally good, and save a considerable trouble and delay.

Iron is sometimes calcined *per se*, that is without any mixture, by exposing the filings, spread with a large surface, to the action of flame for a considerable time, which converts the iron into a *crocus martis*, that, when levigated, is fit for use. But this preparation is also troublesome and inconvenient, requiring a strong and continued fire; and, when made, affords nothing but what may be much easier obtained by the methods below given.

Iron is also calcined by means of sulphur, which must be performed in the same manner as was directed above, p. 206, for the calcined copper. There is not, nevertheless, any difference betwixt this and the calcined vitriol.

The precipitation and calcination of green vitriol are the most expedient preparations of iron, and answer all the purposes of the others fully, except in the instance before-mentioned of not producing quite so cool a yellow as the rust formed by vinegar. The precipitation of vitriol may be formed in the following manner.

“ Take any quantity of green vitriol and dissolve it in
 “ water. Add to it gradually a solution of pearl-ashes in
 “ water. (which need not in this case be purified if the
 “ salts be clean) till no more effervescence arise; and
 “ then pour off the fluid when the precipitated powder
 “ has settled. The remaining fluid, which cannot be
 “ poured off, may be separated from the powder by means
 “ of a filter, and the powder then dried; for as the salts
 “ will be no way injurious to the enamel, there is no oc-
 “ casion for washing in this case.”

This ochre, or precipitated iron, will nearly answer the same end as the rust by vinegar, and will afford a transparent yellow almost as cool; this is therefore the best, and much the easiest preparation of iron for forming greens, by the admixture of blue.

The calcined vitriol must be prepared from crude vitriol, where a red colour is wanted, in the same manner as was before directed, p. 57, for the scarlet ochre, which is itself indeed the substance in this case wanted, and will either afford, with less flux, a red colour in enamel, verging to the orange; or with more flux, a transparent yellow of the warmer cast. But where calcined iron is wanted for forming more purple tints, the precipitated ochre, as produced by the above means, should be taken and calcined with a strong fire, till it acquire the degree of purple desired, to which it may be brought by a much shorter calcination than any other preparation of iron.

ANTIMONY is used for producing a yellow colour in enamel, as well as the white before-mentioned; and, indeed, it is the most useful, and most used, of any substance whatever for that purpose. It is prepared only by levigation, to which its texture, notwithstanding its being a se-

mi-metal, very well suits it. An orange colour, but not bright, may also be produced by antimony calcined with an equal weight or less of nitre, and then separated from the scoria that will surround it, and levigated. But as there are methods of compounding an orange colour from preparations necessary for other purposes, there is no great occasion to have recourse to this. There is a great difference in the antimony itself in different parcels, some being greatly debased by mineral sulphur, and others more free from it. That is best which is striated, and has more the appearance of metal, or rather seems formed from needles laid parallel to each other; the blacker and more spongy being more impregnated with crude sulphur. But antimony is so cheap, that it is of no consequence, if the better part only of any parcel be used, and the rest thrown away; and one side in almost every lump is good; as, in the fusing to separate it from the ore, the most metalline part of course subsides and sinks to the bottom of the mass.

GLASS OF ANTIMONY is also used sometimes in enamel painting, being itself a fine transparent orange colour; but as it wants body, it has no great effect but in compositions. They who have occasion for this glass may purchase it at so easy a rate as renders it scarcely worth while to prepare it themselves, being manufactured at Venice, and elsewhere, in very large quantities, by those who make it their business. The only care should be, to choose such as is not adulterated by the admixture of glass of other kinds, which may be distinguished by the force and deepness of the colour, or the want of them.

MERCURY is sometimes also used in enamel painting; but it requires to be prepared by some chymical process before it can be used. There are two preparations already practised for medicinal purposes, which fit it also for enamel painting the best of any. The produce of one is called turpeth mineral; for which we have already given the process, p. 92, by a careful treatment of which, a fine cool yellow may be produced in enamel. The other affords the red precipitate, which is a fine scarlet red, but extremely tender with respect to the fire. As this substance can be procured at a very moderate rate of those who vend it as a medicine, and requires a particular nicety in the operation, I shall wave giving any process for it

here, especially as every book which treats of the chymical pharmacy contains one; and, indeed, the use of both this and the turpeth mineral demand so delicate a management of the fire, and are so liable to have their effect destroyed by a second burning, (if, as is so frequently the case, it should be necessary) that I cannot greatly recommend them in preference to other preparations, which will answer the same ends nearly as well with ease and safety.

ORPIMENT has been also used in enamel for producing a yellow colour; but it is very tender with regard to the fire, and requires so soft a flux, while at the same time antimony, properly managed, will so well supply the place of it, that it is rarely used.

Powdered bricks have been also used for compounding yellow colours in enamel; but as they act only in consequence of the ochre they contain, they are certainly inferior to the prepared ochres we have given, especially as they are liable to great impurities, and are harder, or require a greater force of flux than the pure ochres or calcined iron. When they are used, they should be chosen of the reddest colour, the softest and evenest texture, and entirely free from all stones or cinders. The Windfor bricks, therefore, are much the best that are to be procured here, as they answer to the circumstances required much better than any other.

TARTAR is also used in forming enamel colours, though not from any tinging quality it has in itself, but for its effect in modifying magnesia, and some other substances. The crude red tartar should be chosen for this purpose, and requires no other preparation but to be freed from all impurities, and well levigated.

These are the several substances that are materially necessary for composing as well the grounds as colours and fluxes in enamel. There have been many others introduced into the practice of particular persons, and some indeed into more general use; and the preparations of those have been likewise greatly varied and multiplied. But what I have given are more than sufficient for every purpose; as all the variety of tints, with all the degrees of the attendant qualities, may be produced by a proper

application to them; and the increasing unnecessarily the number of simples and original preparations, can only lead to confusion and embarrassment. Whoever, moreover, acquires a moderate knowledge of the principles and subject, here laid before them, may easily proceed to examine or use any other colouring substance which is fitted by its texture to endure the heat of vitrification.

SECT. IV.

Of the compounding and preparing the Fluxes for Enamel Painting.

IN order to the understanding, and consequently managing more advantageously the several compositions for fluxes, it will not be improper to inquire a little more particularly into the nature of the ingredients, and their operation on each other, as well as the proportion of power each has in producing its proper effect; since, by this means, the several mixtures may be better adapted to the purpose, on each occasion, by those who use them, when their nature and degree of efficacy is well understood, than they possibly can by any particular recipes, though in order to give such an initiative knowledge of each particular as may lead to proper experiments, I shall subjoin a complete set of such recipes, as well for the preparation of these as the colours.

There are two kinds of substances enter the composition of enamel fluxes. The one the proper matter of the flux, being such bodies endued with a great propensity to run into the vitreous fusion, or be converted into glass, and which act, in this view, not merely in a passive capacity, by becoming glass themselves, but, when become so, change and assimilate other bodies to their own vitreous nature. This kind consists of salts, lead, and arsenic. The other kind consists of the correctives of these proper fluxings, which, without the admixture of such correctives, would be found to have qualities that would deprave them for the several purposes of enamel painting. For salts, when vitrified alone, or with a small proportion of other bodies, are still liable to be dissolved by aqueous moisture; and glass, under such circumstances, is extremely apt to suffer a corrosion by the air, and turn black and dull on

its surface; whence it is necessary to combine some other bodies with the salts, which may counteract these bad tendencies, and render the composition durable. Lead and arsenic, likewise, when formed into glass, of which they compose the principal part, are liable to corrosion by the air, and to acquire specks and a dull surface, which makes it necessary to add such substances to them as will prevent this effect. These corrective bodies of the proper matter of the flux, which therefore make the other kind of substances of which enamel fluxes are composed, are calcined flints, sand, or such calcarious matter; which being perfectly white, and resisting, in a vitreous state, the corroding or dissolving action of all menstrea, give body and firmness to the fluxing compositions without discolouring, or any other way changing the proper fluxing qualities, except by diminishing, in a certain degree, their vitrifying power, and consequently rendering them somewhat weaker as fluxes than they would be alone.

The most active flux among salts is *borax*; which, indeed, possesses this power in the greatest degree hitherto known of any simple whatever. The next is *lead*, which vitrifies with a very moderate degree of heat, and assimilates to glass, with itself, not only many kinds of earth, but all metals and semi-metals, except gold and silver, in their entire state. *Arsenic* is the next powerful flux, only it requires to be fixed by conjoining it with some other body already vitrified, otherwise it sublimes and flies away before it arrives at the vitrifying heat. The several kinds of salts have the next degree of fluxing power, and among them sea salt possesses the greatest. But they are not sufficiently strong themselves to form an enamel flux soft enough to be used in painting; though, as they are colourless, which is not the case of vitrified lead, they are very necessary to be compounded with lead, or used in its place, assisted by borax, where absence of every degree of colour is necessary in the flux.

OF THE GENERAL METHOD OF PREPARING FLUXES.

The method of preparing the several fluxes below given is the same for all. The ingredients are to be well levigated with each other on a porphyry stone, with a muller of the same matter, or of flint; or in a mortar of agate,

or flint with an agate pestle, except where great quantities are to be prepared, in which case a mortar and pestle of the common green glass may be previously used for the sake of expedition.

Being levigated, the matter should be put into pots of a proper size, made of the substances, and in the manner directed p. 193, and placed in a furnace where the heat is nearly that of a strong culinary fire. For though a greater heat accelerates the vitrification, yet it renders the composition harder, that is, weakens its fluxing power. When the vitrification is perfect, which must be known by the matter's becoming transparent, and free from air bubbles, it must be taken from the fire, and poured out on an iron plate clear of any rust.

Then being powdered when cold, if the operation appear to have succeeded, the produce must be kept for use; but, if any turbidness or foulness appear in particular parts, such parts should be picked out; or, if the whole be depraved with specks, or be cloudy, it should be again powdered and fused, and then treated in the same manner as at first.

OF GLASS OF LEAD.

Simple glass of lead, though a soft flux, is not proper to be used alone; for the air, as was before-mentioned, corroding it, a cloudiness or skim is apt to come on the surface, which gives a dulness and unpleasing appearance to the enamel, and sometimes fouls the brighter colours. As this glass forms, however, in a more compound state, one of the best fluxes, the preparation of it simply is necessary to be known; for though the ingredients which compose it might be fluxed together with the other ingredients of the fluxes and colours, yet it is better to vitrify it separately first, and consequently purify it from those feculencies and dross which are apt to be formed in the first fusion. The manner of preparing glass of lead, such as is to be understood to be meant in the succeeding recipes, is as follows:

"Take of red lead two pounds, of flints calcined and levigated as above directed, p. 197, or in default of flints, of white sand ground to fine powder, one pound; vitrify and prepare them according to the general directions before given."

*Composition of a Flux, for common purposes, moderately soft.*N^o 1.

“ Take of the glass of lead one pound, of pearl-ashes
 “ six ounces, of sea salt two ounces. Treat them accord-
 “ ing to the general directions for fluxes.”

This is a very cheap flux, and will serve extremely well
 for all purposes where a tinge of yellow will not be inju-
 rious, or where the flux is not required to be extremely
 soft.

*Composition of a soft Flux for common purposes.*N^o 2.

“ Take of the glass of lead one pound, of pearl-ashes
 “ six ounces, of borax four ounces, of arsenic one ounce.
 “ Proceed according to the general directions.”

This is a very soft flux, and will vitrify a very large
 proportion of zaffer, or the precipitated powders, or calxes
 of metals. It is therefore very proper for forming strong
 glazing colours, where harder fluxes are used with the rest,
 or for all purposes where there is any necessity for, or
 convenience in, burning the enamel with a slighter heat.

*Composition of a transparent Flux, perfectly white, and moderately soft.*N^o 3.

“ Take of common flint glass powdered one pound, of
 “ pearl-ashes six ounces, of sea salt two ounces, of borax
 “ one ounce. Proceed as with the others.”

This is proper for purples, crimsons, and such colours
 as are injured by any tinge of yellow; as also for white,
 purity is required. It is rather harder than N^o 1, above
 given, but that may be corrected, where necessary, by any
 intermediate proportion of borax between that given here
 and in the next.

Composition of a transparent Flux perfectly white, and very soft.

N^o 4.

" Take of common flint glass powdered one pound, of
" pearl-ashes and borax each four ounces, of common
" salt and arsenic each two ounces. Mix and flux them
" according to the general directions. But they must re-
" main in fusion longer, if any cloudiness appear in con-
" sequence of the arsenic; which, though indued with a
" strong fluxing power, when in a vitreous state, does not
" nevertheless vitrify, when the proportion is large with
" respect to the other ingredients, so quickly as they do,
" but gives a milky turbidness to the glass till its own vi-
" trification be perfect."

This is a very soft flux, and proper in all cases, where
such is necessary, and the yellow tinge of the common soft
flux above given would be detrimental. But the propor-
tion of borax or arsenic may be varied as is above inti-
mated, either in this, or any of the other compositions;
or the arsenic and sea salt omitted according to the occa-
sion. The proportions of the other ingredients should,
however, be adhered to, because they are such as are most
advantageous with respect to the relation the qualities of
each have to the other, and to the general intention.

OF THE WHITE VENETIAN GLASS AS A FLUX.

The principles on which fluxes are formed, and the na-
ture of the substances proper to form them, having been
very little understood, or indeed known, and the compo-
sitions of the fluxes used having been kept secret at Venice
and Dresden, or by the few elsewhere who have learnt
them, it has been almost universally practised to use the
white Venetian glass as a flux. It has not, nevertheless,
that I know of, been lately imported into this country, or
any where regularly sold for this purpose, but obtained by
those who use it, by seeking out drinking-glasses, small
vases, or such other wrought pieces. Indeed I am in some
doubt whether the same glass be now made at Venice or
elsewhere, but that what is found is the remains of a kind
formerly made, and dispersed all over Europe, while the

Venetians had the monopoly of such sort of manufactures wholly in their hands. This glass is of a moderate softness, and agrees very well with the colours in general; but having a milky turbidness, must certainly be less advantageous to the transparent or glazing colours than a flux perfectly pellucid. The composition of this glass is not known at present to any here, for all the kinds described by Neri seem much harder than this; though, as he gave all the compositions then in use in Italy, and particularly understood the Venetian manufacture, one might have expected he would have taken it in, as it must have been made in very large quantities, from the copious remains of it we find in every part of Europe. This glass may be known from any common kind by its having a milky turbidness, by which it may be distinguished from all transparent sorts, and by its yet coming much nearer to transparency than any of the white opaque kinds made at present.

SECT. V.

Of the Composition and Preparation of White Enamel for Grounds and other purposes.

COMPOSITION OF COMMON WHITE ENAMEL OF MODERATE HARDNESS.

Nº 1.

“ TAKE of glass of lead one pound, of pearl-ashes and
 “ calx of tin each half a pound. The ingredients
 “ being thoroughly mixt, by grinding them together on
 “ a porphyry stone, or by pounding and rubbing them
 “ well in a glass mortar, put them into a proper melting
 “ pot, and give them a moderate heat till they incorporate
 “ thoroughly: but the fusion should not be either strong
 “ or long continued; for, if the glass be perfectly liquefied, the calx of tin is apt to subside; and, consequently, to be unequally mixt in the mass when cold. When the heat has had its due effect, take the pot out of the fire, and pour the matter on a clean iron plate, or into molds to form it into cakes, like the Venetian enamel, if it be so desired.”

This is softer than the common white glass, and about the degree of the common Venetian enamel. It is not very white, nor consequently fit for dial-plates, or other purposes where the clearness of colour is required; but for paintings where it will be covered, or where pure white is not necessary, it will extremely well answer all purposes.

Composition of a very soft White Enamel for common purposes.

N^o 2.

“ Take of glass of lead one pound, of pearl-ashes and calx of tin each half a pound, of borax and common salt each two ounces, and of arsenic one ounce. Treat them as the foregoing; but be very sparing of the heat, and take the matter out of the fire as soon as it forms one homogeneous mass, without suffering it to fuse till it be perfectly fluid.”

This is very soft, and will scarcely admit, if used as a ground, the fluxing of colours upon it, without running into fusion itself with the same heat; and, consequently, mixing with and depraving them; but where it is used without any view to painting over it, either in its own proper colour, or mixed with any other, particularly with black, it is preferable to hard enamel, because it can be wrought with a much less heat, and, consequently, is both more easy to be managed, and less liable to give occasion to the warping or calcining the metal plates, or other bodies, on which it is laid.

Composition of Enamel of moderate hardness, but more perfectly White.

N^o 3.

“ Take of flint-glass one pound, of calx of tin or putty, of the first degree of whiteness, half a pound, of pearl-ashes and common salt each four ounces, and of borax one ounce. Treat them as the foregoing; but the fire may be more freely used than in the case of the last.”

The enamel, if the calx of tin or putty be perfectly good, will be very white, and is proper for dial-plates, or other such uses, where the purity of the white ground is

essential to the value of the work. It will also bear colours very well, where such a ground is wanted for any painting; but if it be found too soft, in proportion to the fluxes of the colours, it may be prepared of a greater degree of hardness by omitting the borax.

Composition of a soft Enamel more perfectly White.

N^o 4.

“ Take of flint-glass one pound, of pearl-ashes and
 “ common salt each four ounces, of borax two ounces,
 “ and of arsenic one ounce. Treat them according to the
 “ general direction; but be sparing of the fire as with
 “ N^o 2.”

This is too soft for a ground for colours, but is fit for any other purposes where enamel of greater whiteness is required, as also for using with other colours where there is occasion to paint with white.

Composition of a very soft Enamel, of the first degree of Whiteness, proper for Painting.

N^o 5.

“ Take of flint-glass one pound, of antimony, calcined
 “ to perfect whiteness, according to the directions in p.
 “ 184, or of tin, calcined with nitre, according to the
 “ directions in p. 199, half a pound, of pearl-ashes and
 “ common salt each three ounces, of borax three ounces,
 “ and of arsenic one ounce. Proceed according to the
 “ general directions; but be very careful to avoid such a
 “ fusion as will render the matter perfectly liquid.”

This composition produces an enamel extremely white and very soft, and is proper to use in painting for linen, or other objects where strong touches of white are advantageous. If it be found too soft, according to the tone of the fluxes for the other colours, the arsenic may be omitted, and part of the borax; but it will, in this proportion, suit the other colours, when the fluxes are judiciously adapted to each kind.

OF COMMON WHITE GLASS AS AN ENAMEL GROUND.

The white glass made at Mr. Bowle's glass-house in Southwark, is frequently used for the grounds of enamel dial-plates, and other painted works. It is a glass rendered of an opaque whiteness by the admixture of a large proportion of arsenic, which, intimately mixed with the glass by a slight fusion, not sufficient to produce a vitrification, retains its opacity, and consequently gives a whiteness to the glass; though, if the fusion were long enough continued, it would assimilate with the glass, and the whole mass consequently become perfectly transparent. This tendency to lose its opacity, of course renders the use of it as a ground enamel more limited and difficult; because where colours are to be used which require repeated burning, or to be continued a longer time in the fire, there will be a great hazard of changing the opaque whiteness into transparency, or such an approach to it as destroys the effect of the ground; and, indeed, in the burning it, even as a ground, particular care is required in the manner. It is likewise harder than the Venetian common glass, or any of the above preparations of ground enamel, as likewise much more brittle, and liable to crack or peel off from the body painted with it; but, notwithstanding these disadvantages, its low price and great whiteness, which much surpasses that of the Venetian, or any enamel commonly to be had, have recommended it to the practice of many who are concerned in cheaper works of enamel.

SECT. VI.

Of the Composition of the colouring Substances, together with the proper Fluxes, in order to the Painting with all the variety of Colours in Enamel.

Composition for the Scarlet or Crimson Red, improperly called Purple of Gold.

N^o 1.

“TAKE off the fluxes, N^o 1 or 2, or Venetian glass, six parts, and of the *calx casti*, or precipitate of
K 3

" gold by tin, as directed p. 202, one part; mix them well together, and paint with them."

This will produce a very fine crimson colour, according to the teint of the precipitate of gold used; for it may be prepared very crimson by the means above directed, as I have more than once seen, though, as it is commonly prepared, it verges to the rose or purple. If the effect of red be not strong enough, but the colour tend too much to transparency, it may have a greater body given it by adding more of the precipitated gold.

Composition for transparent Scarlet or Crimson Colour.

N^o 2.

" Take the flux, N^o 2, six parts, the precipitate of gold with tin one part. Flux them together, with a strong fire, till the whole appear a transparent deep red glass.
" Then pour out the matter on a clean iron plate, and levigate it well, when it will be fit for painting."

This preparation will answer the end of lake in oil painting, either for glazing or making dark shades of red. A greater quantity of the gold precipitate may be added where a stronger force of colour is desired to be had, and the composition must in that case be longer continued in fusion. But the flux will not always vitrify more than this proportion, so as to render it perfectly transparent.

If this preparation be mixed, after it has been levigated, with a sixth part more of the gold precipitate, and used without a second fluxing, it will give a very fine deep crimson, extremely serviceable in many cases.

Composition for a bright Orange Red.

N^o 3.

" Take of the fluxes, N^o 2 or 4, two parts, of red precipitate of mercury one part; mix them for painting."

This makes a very bright orange red, but is very delicate, requiring only just so much heat as will run the parts of the flux together. It is therefore difficult in its use where harder compositions are to be burnt with it.

Compositions for a cheaper, but fouler Scarlet Red.

N^o 3.

" Take of the flux, N^o 1, two parts, and of the scarlet ochre as prepared, in p. 57, one part; mix them well together, and avoid too much or too long heat."

This is the common red in China, and other enamel paintings. It may be enlivened by mixing one part of glass of antimony with one part of the flux, instead of using the flux alone.

Composition of a cheap Crimson.

N^o 4.

" Take of the flux, N^o 1, four parts, of magnesia one fourth of a part, and fuse them till the whole mass be transparent; mix them then with one part of copper calcined to redness, and paint with the composition. Where this is required to be transparent, the calcined copper should be vitrified with the other ingredients; but this requires great care to take the composition out of the fire as soon as the vitrification is perfected."

A little white enamel, or, what is better, a little of the tin calcined, by means of nitre, as in p. 199, may be added, to give the colour a body. But this necessarily dilutes the colour, and weakens the force of it.

This red is very tender, and requires only so much heat as will incorporate the substances together. But if it be found too soft for the tone of the fluxes of the colours, instead of using the flux, flint-glass with a small part of flux may be employed for mixing with the magnesia.

The management of this colour is, however, so difficult and nice, where it is used in very light touches, that in nicer paintings it is better to use the precipitate of gold properly broken by the admixture of other colours, where a fouler crimson is wanted, than to be troubled with watching this. But in grosser works, where the colours are used in great quantities, and laid on with a stronger body, this becomes very serviceable.

In the recipes given for the red formed by calcined copper, it has been used to order an equal, or some such proportion of red tartar. But where the glass contains any lead, I am apt to believe a reduction of it would follow, which would decompose the body of the flux, and render the composition harder. If tartar be used, the flux ought to be formed therefore of glass of salts.

*Composition for Pink and Rose Reds.*N^o 5.

“ Take any of the above compositions, and add of any
 “ of the white enamels, or of the calx of tin, prepared
 “ with nitre, or calx of antimony, as much as shall be suf-
 “ ficient to dilute the colour to the degree required.”

*Composition for the brightest Blue.*N^o 6.

“ Take of the fluxes, N^o 1 or 2, or of the Venetian
 “ glass, six parts, of the finest ultramarine one part; mix
 “ them well for painting. If a transparent blue be de-
 “ fired from ultramarine, a sixth or eighth part must be
 “ added to the flux N^o 2, and the mixture kept in fusion
 “ till the ultramarine be perfectly vitrified, and the whole
 “ become transparent.”

If the body of colour be not sufficient, more ultramarine may be added; but in order to spare it, a small proportion of zaffer, fluxed with four or six times its weight of borax, may be added; which, if the zaffer be perfectly good, will make the ultramarine appear much darker, without impairing its brightness.

*Composition of a lighter Blue.*N^o 7.

“ Take of the fluxes, N^o 3 or 4, five parts, of ultrama-
 “ rine ashes one part; mix them for painting.”

This is used by those who do not know the proper manner of using zaffer; but as the pure ultramarine ashes have a strong tinge of the red, and are never of the first degree of brightness, the same effect, or indeed a superior one, may be produced by the compositions below given.

If the ultramarine ashes are adulterated with copper, as is most frequently the case, a green and not a blue will be produced.

*Cheaper light transparent Blue.*N^o 8.

“ Take of the deepest coloured common smalt, and
 “ use it simply; or, if it be too hard for the other co-
 “ lours, as frequently is the case, add to it a small pro-
 “ portion of calcined borax.”

If the smalt be good, the colour will not want bright-
 ness; but it will always be warm, and tending to the purple.

Its cheapness is however a great recommendation in many cases.

Composition of a deep transparent Blue.

N^o 9.

" Take of any of the fluxes four parts, of zaffer one part; mix and fuse them with a strong fire till the whole mass be perfectly transparent; but, if the quantity of flux be not sufficient to vitrify the zaffer, add more or a small proportion of borax. When the vitrification of the whole is perfect, pour out the composition, and levigate it for use."

This will produce a very fine transparent blue; and, being extremely deep, will make very strong shades, and give the effect of blackness, where there is a strong body of it laid on.

This may be done with less zaffer, when a less strong effect of the colour is wanted.

Composition of a very dark transparent Blue.

N^o 10.

" Take of the fine Saxon smalt, mentioned p. 202, and mix with it one fourth of its weight of calcined borax, or one-third of its weight of purified pearl-ashes."

This will run easily, and will produce a very fine dark blue of the deepest hue. But where this kind of smalt cannot be obtained, composition, N^o 9, must supply its place; and if the zaffer be good, will not be a bad substitute; but it cannot be expected to have the full brightness of ultramarine.

Composition of a sky Blue.

N^o 11.

" Take any of the above preparations, and add of any of the white enamels, or calxes of tin or antimony, as much as will be sufficient to produce a blue of that lightness which may be wanted."

By forming a blue in this manner, from the composition N^o 6, the effect of the ultramine ashes may be fully pro-

duced as is above intimated, without the defects that are generally found in them.

Composition of azure Blue from Copper.

N^o 12.

“ Take of the fluxes, N^o 3 or 4, five parts, of copper calcined to a purple colour and of zaffer, each one part; mix and flux them well together, and then levigate with the mixture, of the calx of antimony or tin, calcined by nitre, one part, and keep the matter for painting.”

This is so precarious with respect to the success, that it is rarely used; but it will sometimes produce a good blue, and is then cooler and better for some purposes than the blues formed either of zaffer and white, or the ultramarine ashes.

Composition of a bright opaque full Yellow.

N^o 13.

“ Take of the fluxes, N^o 1 or 2, four parts, and silver calcined with sulphur, as in p. 188, and of antimony each one part; mix and flux them well together till the whole be perfectly vitrified: then levigate with them one part of antimony or tin, calcined by means of nitre, and keep the matter for painting.”

This is a full true yellow, and the brightest coloured composition that can be used. It may be made deeper by diminishing the proportion of the calx of antimony or tin.

Composition of a bright transparent Yellow.

N^o 14.

“ Take of the fluxes, N^o 1 or 2, six parts, of calcined silver two parts, and of antimony one half part; flux them well till the whole be transparent, and then levigate the colour for use. Where great transparency is wanted, the antimony may be omitted.”

This is a very deep bright yellow, and proper for shades or glazing, where great force and purity of colour is required; but for most purposes the cheaper transparent yellow

low will answer the same end, not being greatly faulty in point of brightness.

Composition of a bright transparent Yellow from Silver and Iron.

N^o 15.

“ Proceed as in the above, only instead of the antimony take the precipitated iron as obtained from vitriol, according to the directions in p. 210.”

This will be more transparent in general than the same preparation with antimony; which, differing in the proportion of crude sulphur it contains, does not always submit to be vitrified to a greater degree of transparency. The yellow prepared in this manner will likewise be very cool and true, and consequently proper for forming some kinds of greens.

Composition of a cheaper opake full Yellow.

N^o 16.

“ Take of the fluxes, N^o 1 or 2, or Venetian glass, six parts, of antimony one part, and of the iron precipitated from vitriol half a part; mix and flux them well together till the matter be thoroughly vitrified, and then levigate them with one part of tin calcined to whiteness.”

This will differ only from the yellow of N^o 13, in not being quite so bright and full, but will, nevertheless, be a very strong pure yellow, and fit for all uses where the greatest brightness is not requisite.

Composition of a warmer opake Yellow.

N^o 17.

“ Proceed as in the above, only instead of the precipitated iron take the scarlet ochre prepared as in p. 57.”

Composition of a cheaper transparent warm deep Yellow, to answer the purposes of brown Pink.

N^o 18.

“ Take of the fluxes, N^o 1 or 2, six parts, and of the
“ precipitated iron one part; mix and fuse them in a
“ strong fire till the mass be transparent.”

This will verge towards the orange, but will not be sufficiently bright to answer the purpose of a pure yellow. It is, however, extremely valuable for shading yellow, and other uses where a brown is required.

Composition of a warmer transparent Yellow, for the same purposes as the preceding.

N^o 19.

“ Take of the fluxes, N^o 1 or 2, six parts, of scarlet
“ ochre one part, and of glass of antimony half a part;
“ mix and fuse them till the mass be transparent.”

This differs from the last only in verging somewhat more to the red.

Composition of a transparent Yellow from Orpiment.

N^o 20.

“ Take of the flux, N^o 2, three parts, and of the re-
“ fined orpiment, or King's yellow, one part; mix them
“ by levigation for use.”

This composition is extremely tender, and must have no more fire than will just make the parts of the flux cohere.

If this yellow be desired warmer, a little glass of antimony may be added, or a proportion of red orpiment may be used with the yellow.

Composition of lighter Yellows.

N^o 21.

“ Add to any of the above common calx of tin or put-
“ ty; or, if great brightness be necessary, the calx of tin
“ or antimony calcined by means of nitre.”

Composition of a very bright opaque Green.

N° 22.

“ Take of ultramarine and yellow, N° 13, each one
 “ part, of the fluxes, N° 1 or 2, two parts; mix them well
 “ together for painting.”

Composition of a bright transparent Green.

N° 23.

“ Take of the fluxes, N° 1 or 2, six parts, and of cop-
 “ per precipitated by alkaline salts one part; mix and
 “ flux them till the mass be transparent.”

This will be a very fine deep green, but inclining to the
 blue, which may be easily corrected, when not agreeable
 to the purpose, by the adding a proper quantity of the
 transparent yellows, N° 14 or 15.

Composition of a bright transparent Green by mixture.

N° 24.

“ Take of the yellow, N° 15, and of the blue, N° 9,
 “ equal parts; levigate them well together for use.”

Cheaper composition of an opaque Green.

N° 25.

“ Take of the fluxes, N° 1 or 2, six parts, of copper
 “ calcined to a purple colour and of the opaque yellow,
 “ N° 16, each one part; mix and flux them well, and then
 “ levigate them for use, with one part of the calx of tin.”

Cheaper composition of an opaque Green by mixture.

N° 26.

“ Take of the yellow, N° 16, and the blue, N° 9, each
 “ equal parts.”

By varying the proportion of these mixtures, sea greens,
 grass green, or any other tints, may be produced at will.

Compositions for lighter Greens.

N° 27.

“ Add the calxes of tin or antimony to any of the
 “ above, in the proportion the lightness of the colour re-
 “ quires.”

Composition for a bright Orange colour.

N° 28.

“ Take of the yellow, N° 14, two parts, of the red,
 “ N° 1, one part, and of the yellow, N° 11, half a part;
 “ levigate them together for use.”

N. B. The compositions which are not directed to be
 fused when used alone, must not undergo any in the mix-
 tures to be made of them, but must only be levigated with
 the other ingredients, and used for painting in that state.

Composition of a bright transparent Orange.

N° 29.

“ Take of the red N° 2, and of the yellow N° 14, equal
 “ parts; mix them well together.”

Composition for lighter transparent Orange, extremely bright.

N° 30.

“ Take of the above and glass of antimony equal parts;
 “ levigate and mix them for use.”

When glass of antimony is used, the fire must be spared
 both as to time and degree.

Composition of a cheaper transparent Orange.

N° 31.

“ Take of the fluxes, N° 1 or 2, six parts, of copper
 “ calcined to redness one part, and of red tartar one part;
 “ flux them till the matter become transparent, but avoid,
 “ if possible, continuance in the fire a moment longer;
 “ levigate it till it appear red, and mix with it an equal
 “ part of glass of antimony.”

Composition of a bright opake Purple.

N° 32.

" Take of the red N° 1, and the blues N° 6 and 9, each
 " half a part ; mix them for use."

Composition of a bright transparent Purple.

N° 33.

" Take of the red N° 2, and of the blue N° 9 ; mix
 " them for use."

Composition of a cheaper opake Colour.

N° 34.

" Take of the fluxes, N° 3 or 4, six parts, of zaffer one
 " part, and of magnesia half a part ; fuse them with a
 " strong heat till the whole be transparent, and then add
 " of the red N° 4, one part, and of the calx of tin half a
 " part ; mix and levigate them well together for use."

Composition of a cheaper transparent Purple.

N° 35.

" Take of the fluxes, N° 3 or 4, six parts, of magnesia
 " one half part, and of zaffer one sixth of a part. If a red
 " purple be wanted, omit the zaffer."

This and the foregoing may both be varied, either to a
 more red or a more blue purple, by diminishing or in-
 creasing the proportion of zaffer. If the last be wanted
 more red, it may be mixed with a proper quantity of the
 glass of antimony.

Composition of an opake Brown colour inclining to Red.

N° 36.

" Take of the red N° 3, four parts, and of blue N° 9,
 " one part ; mix them for use."

Composition of a transparent Red Brown colour.

N° 37.

“ Take of the purple N° 33, and of glass of antimony
 “ equal parts, and of the yellow N° 19, one fifth of a part;
 “ levigate them together for use.”

Composition of an opaque olive Brown colour.

N° 38.

“ Take of the yellow N° 16, two parts, of the blue N°
 “ 9, half a part, and of the red N° 3, a fourth of a part;
 “ levigate them together for use.”

Composition of a transparent olive Brown colour.

N° 39.

“ Take of the yellow N° 18, one part, and of the blue
 “ N° 9, and glass of antimony, each half a part; levigate
 “ them together for use.”

These may all be varied by changing the proportions
 of the ingredients, or they may be converted into different
 tints of light browns by adding the due quantities of calx
 of tin, which may be commixt with them when mixture is
 made of the other ingredients, or afterwards.

Composition of a Black moderately hard.

N° 40.

“ Take of the flux N° 1, six parts, of zaffer one part,
 “ of glass of antimony half a part, and of the scarlet
 “ ochre and magnesia each a fourth of a part; mix and
 “ fuse them till the matter become a clear black of the
 “ deepest cast.”

Composition of a Black very soft.

N° 41.

“ Substitute flux N° 2, instead of N° 1, and proceed as
 “ in the last.”

This composition is extremely well accommodated to the painting enamel dial-plates, or painting on enamel or China grounds in the manner of prints, or *chiaro obscuro*. For as it will run with a very small degree of heat, the slightest touches may be brought to shew themselves perfectly without the least hazard of fusing the ground, so as to run them together.

The above compositions may be diversified by compounding them with each other, so as to form all the variety of tints to suit every purpose; and the hardness or softness of the fluxes may be likewise adapted to each occasion by mixing them together. With respect to the proportions in every composition, they may likewise be varied according to the purposes they are used for, there being no positive rules to be laid down in these matters with relation to quantities; for the different degrees in which different parcels of the ingredients possess the requisite qualities, as well as many other circumstances, prevent the effect from being the same, even in compositions exactly alike, as far as regards the quantities. I have, however, endeavoured to give some leading proportions of each kind, by which the necessary mixtures may be adjusted according to every occasion, by a slight consideration on the properties of the ingredients, which I have to this end previously explained. It is by this knowledge only, and a proper occasional application to it, that any artist can ever arrive at great perfection in the use of enamel colours; for the want of it has in general obliged even the most skilful and experienced, who work in enamel, to adhere in many cases implicitly and blindly to the strict forms of recipes, where the preparations have by no means been so well adapted to their purposes as they might have been by slight alterations.

SECT. VII.

Of the manner of laying on and burning the Enamel Grounds.

THE matter of the enamel must be first finely levigated and searced, and the body to be enamelled should be made perfectly clean. The enamel must be then laid

on as even as possible by a brush or pencil, being first tempered with oil of spike, and the distance of time betwixt the laying on the ground and burning the piece should not be too great, because the oil will exhale and leave the matter of the enamel a dry incohering powder, which will be liable to be rubbed or shaken off by the least violence. This is the common method: but there is a much better way of managing this part of the work by means of a searce, in which the enamel is spread with very little trouble, and the greatest part of the oil of spike saved. The method of performing this is, to rub the surface to be enamelled over with oil of spike; and then, being laid on a sheet of paper or piece of leather, to save that part of the enamel which does not fall on a proper object, to searce the matter upon the oiled surface till it lie of a proper thickness. But great care must be taken in this method of proceeding not to shake or move too forcibly the pieces of work thus covered with the powdered enamel.

It is usual to add oil of turpentine to the oils of spike or lavender, in order to make them go further, and save the expence attending the free use of them; and others add also a little olive or linseed oil, or some, in the place of them, crude turpentine. The use of the spirit of turpentine is very allowable, for it is the same for this purpose as the oils of spike or lavender, except that it wants the glutinous quality which makes them serviceable in spreading the enamel. But with respect to the use of the oils of olive and linseed, or any other substantial oil, it is very detrimental, tending to reduce the metalline calxes, and leaving a small proportion of black coal or ashes, which must necessarily injure the white colour of the ground.

When plates, as in the case of pictures, dial-plates, &c. are to be enamelled, they should always be made convex on the outside, and concave within; and all pieces of enamel formed of metal, where the figure does not admit of their being thick and solid, should be of the same kind of form; otherwise they will be very apt to warp in the heat, and cannot be brought strait after they are taken out of the fire, without cracking the enamel. For this reason likewise, it is proper to enamel the work all over, as well on the wrong as right sides, to prevent the heat from calcining the metal, which would both contribute to its warping, and weaken the texture of it.

The enamel being laid on the body to be enamelled, when the first muffle is used the piece must be gently lifted on to the false bottom, and put in that state into the muffle first in the furnace described p. 189, by thrusting the false bottom into it as far as it will go. But it is best to defer this till the fire be perfectly in order, which may be known by putting a bit of tile or China with some enamel on it of the same tone with that used as a proof; and another proof of the same kind may be also put along with the work into the muffle, which, being taken out, may shew how the operation proceeds.

When considerable quantities of pieces are to be enamelled, as in the case of manufactures, instead of putting them into muffles, coffins, or calsoons, such as are described p. 195, are to be used for expedition, that a great number may be put into the fire together. Where this method is to be pursued, the pieces of work to be enamelled are to be laid on the bottom of the coffin till it be covered; and then the second flooring or false bottom is to be fixed in its place, and covered in the same manner; after which the lid is to be put on, and well secured, in the joints it forms with the sides of the coffin, by fire-lute. The proof, in this case, should be laid on the lid, on the part next the side-door of the furnace; and it may be expedient, especially till the working of the furnace, and the kind of enamel used be very well understood, to have two or three of these proofs. The enamel work being put thus into the coffins, they should be set on the dome of the furnace, which must be of the kind described p. 192, that they may be moderately heated before they be put into the furnace, which would otherwise endanger their cracking. When they are so heated, proof having been made by means of a small bit of China, or copper covered with the enamel, that the fire be of a due force, they must be conveyed into the furnace through the side-door, and must rest on the pieces of fire-stone, placed for that purpose on the flooring in the back-part of the furnace. It is requisite, nevertheless, that the conveying them into the furnace should be managed with particular care, to prevent the shaking off the enamel; and it must be done by means of the peel or instrument described p. 195, adapted to this purpose; on which the coffin being laid, it must be gently thrust into the furnace till the coffin be in its proper situation, with

respect to distance from the sides of the furnace. Then the further end of the peel must be turned slowly towards the front of the furnace, the coffin being at the same time shoved off from it by means of the flat end of the tongs before described, introduced through the door for feeding the fire, till it stand entirely on the fire-stones, after which the peel must be withdrawn. The operation being finished, the peel must be again introduced under the coffin, by raising first the nearest end of it, by means of the tongs, through the door in the front; and afterwards the other parts gradually, till the peel support it. They must then be drawn out together, and the coffin may be placed on the dome of the furnace, that, by cooling more gradually, the temper of the enamel may be improved.

If it be required to burn a single piece or two in this kind of furnace, it may be done by means of the common or loose muffle, described p. 193; in which case the enamel work being laid on the bottom or flooring of the muffle, and the muffle put over it, the whole must be conveyed into the furnace by means of the tongs with turned points, through either of the doors. A proof may be at the same time put in, on a piece of tile or spare bottom of a muffle, and the proceedings in other respects may be the same as with the fixt muffle, or the coffins.

Where there is no furnace, and it is desired to burn enamel work on an open hearth, preparation must be made according to the directions in p. 193; and the flooring of the muffle being laid at a proper distance from the nozzle of the bellows, the work must be laid on it, and covered with the muffle. This being done, pieces of charcoal must be heaped over them; and the fire being lighted, must be blown up with the bellows, till it be sufficient to flux the enamel, which must be examined by the proof put into the fire along with the work. The coals must then be taken off from the muffle, and the muffle, with the flooring and enamelled work, removed out of the fire, but kept near it to prevent their cooling too fast. If there be more work to be burnt, another muffle, &c. may be immediately put in the place of the other, and the same operation repeated; for it is a matter of indifference whether the coals be burning when the work is put on the hearth, or kindled afterwards.

Pit-coal may be used in the furnace, where enamel is burnt with the fixt muffle, or in coffins; which is indeed one principal conveniency attending the use of them, as it saves a considerable expence of charcoal. But where the open muffle is used, charcoal alone should be employed, as the fumes of mineral coal are very detrimental to some colours, and destructive of the grounds, if whitened by arsenic, as the common white glass.

SECT. VIII.

Of the manner of laying on and burning the Enamel Colours:

THE colours being prepared as above directed, must be reduced to powder by due levigation and washing over, where they are required to be extremely fine, and there is no unvitrified salt in the mixture. They must then be tempered on a China or Dutch tile with oil of spike or lavender, to which most artists add likewise oil of turpentine, and some (but I think erroneously, as I have before mentioned) a little linseed or olive oil, and in this state they are to be used as paint of any other kind. But it should be avoided to mix more of the colours with the essential oils than will be immediately used, because they dry away extremely fast, and would not only be wasted, but give a cohesion to the particles of the colours that would make them work less freely when again diluted with the oil.

The colours being thus laid on the pieces to be painted, the proceeding must be in all respects the same as with the grounds, in whatever manner they are to be burnt, either in the muffles or coffins; but greater nicety must be observed with respect to the fire, as the effects of any error in that point are of much greater consequence in the burning the colours than the grounds, especially if the white of the grounds be formed from the calx of tin or antimony, and not arsenic.

Pit-coal, as was above observed, may be employed for burning as well the colours as the grounds, where the muffle or coffins are used, or any other method pursued that wholly hinders the smoke and fumes from having any access to the enamel.

CHAP. IX.

Of the Method of Painting on Glass by Burning, or with transparent Colours that vitrify.

SECT. I.

Of the general Nature of Painting on Glass with vitreous Colours.

THE art of painting on glass with colours that vitrify has been esteemed, as far as regards the composition and burning of the colours, a mystery known perfectly in the former ages, but lost in a great degree to the present times. It will appear, however, on due examination, that the case is far otherwise, and that the lost state of this art is owing to a very different cause. It will be proved, that from default of artists who cultivate this manner of painting, which probably would not find many patrons at present, the dexterity or experience of making an advantageous use of the colours, so as to form good pictures, is alone wanting. But that as to the knowledge of the preparation of the colours, and the method of burning them, we possess them from the modern improvements of chemistry in a much more extensive degree than the former times: from whence it may be justly concluded, that if any able painters were to apply themselves to this way of working, undoubtedly much better pictures would be now produced than those we so much value as remains of an art of which we mistakenly suppose the methods of execution at present lost. The great progress which Mr. Paterson, in Effex-street in the Strand, London, has made in an undertaking to establish a manufacture of painted glass, is an evident proof of this, several of the pieces produced by him exhibiting colours in an equal, or, perhaps, much greater perfection than is found in the old paintings. For the sake

therefore of others, who, from views either of profit or amusement, may choose to apply themselves to the reviving this species of painting, I will give such lights into the nature of the subject, and the manner of pursuing it practically, as may enable any who can paint in oil, water, or other vehicles, soon to become masters of every thing peculiar to this art.

The painting with vitreous colours on glass depends entirely on the same principles as painting in enamel, and the manner of executing it is likewise the same, except that in this the transparency of the colours being indispensibly requisite, no substances can be used to form them but such as vitrify perfectly; since, without such vitrification, there can be no transparency. In other words, the whole mystery consists in finding a set of colours which are constituted or composed of such substances, as, by the admixture of other bodies, may promote their vitrification and fusion, are capable of being converted into glass, and melting when in that state, with less heat than will melt such other kinds of glass as may be chosen for the ground or body to be painted;—in tempering these colours, so as to make them proper to be worked with a pencil;—and in burning, or reducing them by heat to a due state of fusion, without injuring or melting the glass which constitutes the body painted.

The circumstances of this art are so analogous to those of the art of enamelling, that the same means will, as I have before intimated, serve for almost every particular purpose that occurs in the prosecution of it. I have therefore but little occasion to enter into the detail either of the preparation of the colours or the use of them; as it will be sufficient to refer for most particulars to what has been before said, and only to shew how the methods there taught are applicable to this intention.

SECT. II.

Of Glass as a Ground for Painting with vitreous Colours, or by Burning.

THE first object to be regarded is the choice of grounds, which should be plates, or vessels of glass, that are of the first degree of hardness, but at the same time colour-

less, and without specks or wavings. The glass which has these qualities, in the greatest degree, is the best of the kinds of that used for windows, except such as is made for looking-glasses, which, though most colourless and clear, is softer, from the quantity of borax and other fluxes which enter into its composition. This sort, which is called crown glass, being a glass of salts, is hard and transparent, and, being ready formed into plates, may consequently be had in a state proper for use. But where paintings of any consequence are undertaken, a composition still better suited to this purpose should be employed, and the glass wrought in the same manner as the looking-glass plates alone are at present.

When larger objects are to be depicted than the size of single plates of glass can contain, it is practised to join several squares together, which may be prepared for the painting in this manner: An even board of the size of the whole of the plates laid together, should be sprinkled with a mixture of resin and pitch, which being melted by a flat iron held over it, the plates of glass should be placed on the board as close to each other as possible, and will be firmly fixt in the situation they are laid, by the cement of resin and pitch as it cools. The glass being so fixt, must be cleaned from any of the cement which may have run through the joints, first by scraping, and after by rubbing with spirit of turpentine. It will then be in a condition to be painted with the ground colours, which being performed, the plates may be taken off the board by passing the flat iron heated over them at a proper distance, which melting the cement, will let them loose from the board, and they may then be burned separately without any inconvenience. They may then again be fixed on the board by means of the cement, and the painting completed, or proceeded with to the degree that requires another burning.

SECT. III.

Of the Fluxes and Colours to be used in Painting on Glass by Burning.

THE same substances and manner of preparation of fluxes and colours, which serve for the purposes of enamelling, will serve equally well for the purposes of

painting on glass by burning, except as was before observed, that all those bodies which will not perfectly vitrify with such a force of flux and heat, as can be applied expediently with respect to the glass which forms the ground painted upon, must be wholly omitted.

I shall therefore wave any particular instructions for the preparations of the fluxes and colours for this kind of painting as needless repetition, and only enumerate the compositions before given, which are proper to be used in each intention, by referring to the numbers prefixed, and subjoining directions for the particular treatment of them, when applied to this end, where any such is necessary.

The fluxes above given may be used as there prepared, and the same discretion must be exercised in adjusting the stronger or weaker to the ground as in the case of enamel. But if the hardest of the two kinds of fluxes should be found too soft in any instance of its application, it may be mixed with a due proportion (which must be found by trial) of the glass of the ground levigated to perfect fineness.

To produce white in this kind of painting, the artifice of leaving the ground unpainted, or slightly obscured where a fouler tint is wanted, must be used instead of an actual white body, unmodified light transmitted through the glass supplying the place of the reflected, and with the same effect in these circumstances as the reflected in the others.

The lighter tints of all the colours, such as rose, or pink colour of crimson or scarlet, carnation of orange, straw colour of yellow, and sky colour of blue, must be produced on the same principle as white, by laying on a less body of the colour, and consequently suffering it to be diluted by the light passing through the glass, instead of that reflected when bodies are mixt with the colours. The method of effecting this must therefore be either to spread the colours thinly on the ground, or when the compositions given appear to have yet too great a body, to dilute the colour by mixing with it an additional quantity of flux; or, if that render the mixture too soft, of levigated glass the same with the ground. In this manner, tints of all degrees of lightness may be produced with equal certainty and ease, as by the addition of white in enamel and other kinds of painting; and with this further

advantage, that, if the colours are wanting in brightness, they yet bear up and support their force much more than those equally foul would in the other method of use. I shall therefore omit any directions for the producing the diluted colours; (that is to say, those which in other kinds of painting are to be formed by the addition of white) as likewise all such others as are to be obtained by the compositions above exhibited in treating of enamel, and proceed only to enumerate them, subjoining only remarks on a case or two where they are peculiarly material.

For a bright red, take N^o 2, which will be crimson or purple, according to the colour of the gold used; for a fouler red, take N^o 4, but it is extremely tender, and must not be run to perfect fusion, nor continued long in the fire: when a more scarlet red is wanted, mix N^o 2 with glass of antimony.

For a very bright blue, take N^o 6, rendered perfectly transparent by fusion. But this being formed of ultramarine, which, when good, is of very high price, the use of it may in most cases be avoided by substituting the following compositions, as the effect which colours have in this way of painting is so advantageous, even to those that are fouler, as renders brightness of less consequence than in any other case: for a full blue, which will not be wanting in brightness, but rather inclining to warmth, take N^o 9: for a very cool blue, take N^o 12, without the calx of antimony or tin: for a truer blue than either of the last, mix them in the proportion that will produce the teint desired; but the blue of N^o 12 verges more towards the green, than in proportion to the warmth of N^o 9, when good.

For a very bright yellow, take N^o 14, without the calx of antimony or tin, or N^o 15: for a cheaper yellow, take N^o 18: for a cheap warm yellow, N^o 19.

For a very bright green, take N^o 18, prepared transparent, and N^o 14, without antimony, and mix them in that proportion which will render the green produced more inclining to the blue or yellow, according to the occasion; but this composition being expensive on account of the ultramarine in N^o 14, and extremely great brightness being seldom essential, as was before observed, in this kind of painting, the following may, in most cases, be substituted for it to advantage:—for a cheaper bright green, take N^o 23, with the addition of a proper quantity of N^o 18,

if it be required to incline more to the yellow: for a cheap, but less bright green, take N^o 9 and N^o 18, and mix them in the proportion to form the teint wanted.

For a bright orange colour, take N^o 2 and N^o 14, without antimony: for a cheaper, but more diluted orange, take glass of antimony, or a mixture of it with the foregoing: for the diluted orange, called *carnation*, take glass of antimony ten parts, the purple of N^o 35, (the zaffer being omitted in the preparation of it) one part, and mix them with the fluxes N^o 1 or 2, according to the body of the colour desired.

For black, take N^o 40 or 41.

For a red brown, take N^o 37; for an olive brown, take N^o 39; or foul any of the reds or yellows before given with a due proportion of black.

From the combinations of some of these, all the other variety of teints, both with respect to difference of hue or of lightness of colour, may be produced; and, if the manner of painting should ever make it necessary to diminish the transparency of any of them, it may be done by adding a small quantity of any of the compositions for white enamel, in that proportion which will produce the effect desired.

SECT. IV.

Of the manner of laying the Colours on Glass Grounds, and Burning them.

THE same affinity betwixt painting in enamel and on glass by burning, which renders the preparation of the colours so much the same in both, extends itself also to the manner of laying the colours on the grounds, and burning them.

The manner of tempering the colours, and painting with them on glass, may therefore be exactly the same as was before directed for enamel; the oils of spike or lavender, and of turpentine, being alike suitable in this case as in the other. But with respect to the manner of burning the colours, though the general methods must be the same, yet a variation in certain particulars is in some cases necessary, which I shall therefore take notice of here.

Smaller plates, or other figured bodies of glass, may have the colours burnt in the fixt or loose muffles; but larger plates require coffins, which may be formed in the same manner as was directed for enamel. Though, as the form of the plates in this case are flat, and not convex, as is necessary in the other, a number of layers or strata may be put into the same coffin; for it is not material how near the surfaces of the plates are to each other, provided they do not touch. The best method of placing them to advantage in the coffins is to have iron plates adapted to the coffins. These iron plates should have at every corner a small bit of iron going off at right angles, that the plates being put over each other may be supported by these bits of iron acting as short pillars, and kept at such distance from each other, as will suffer the glass to lie betwixt them clear of all contact with any other body, as far as regards their upper surface. The bottom plate, nevertheless, must have no pillars, as there will be nothing under it but the substance of the coffin. These iron plates must be made so much bigger than the plates of glass, that the latter may lie upon them clear of the pillars, which should rest on the iron plates under them, and not on the glass. The iron plates being in this manner adapted to the coffins, the bottom must be put into it, and one of the plates of glass laid upon that, but at such an exact distance from each side, that the pillars of the next iron plate may not rest upon it, but on the bare part of the iron plate under it. Another plate of glass must be then laid in the same manner on this plate of iron, and the same proceeding continued till the coffin be filled; then the lid must be luted on, and the same method observed in all other particulars as was before directed for the burning enamel paintings. As there may be occasion, however, to use larger coffins for painted glass than enamel, the dimensions of the furnace must, when such are wanted, be varied accordingly. But it will not in this case be necessary to enlarge the area of that part of the furnace which contains the fuel in depth; for, if it be increased in length, from side to side, in proportion to the increased magnitude of the coffins, it will sufficiently augment the body of fire.

CHAP. XII.

Of Gilding Enamel and Glafs by Burning.

THERE are two methods of gilding enamel and glafs by burning or annealing; the one is the producing a cohesion of the gold with the glafs or enamel, by the intermediate of a flux; the other by producing the like effect without any. But the principle is the same nevertheless in both; and is in fact no other than the causing the gold to adhere to the enamel or glafs, in consequence of the fusion or approach to that state, either of the flux used, or the body of enamel or glafs itself, by which the gold is cemented to such body.

The flux, when any is used, may be either simple glafs of borax, or any of the above-directed preparations of fluxes powdered.

There are other differences likewise in the manner of this gilding, which respect the state of the gold; for it may be either used in the form of leaf-gold, or in that of powder, either mechanically made, or by precipitation.

When leaf-gold is employed for gilding enamel or glafs, in this way, without any flux, the enamel or glafs may be moistened with a very weak solution of gum Arabic, and again dried. Being so prepared, it should be breathed upon till it become a little adhesive or sticky, and then it should be laid upon a leaf of gold; and if that be not sufficient to cover it, the remaining part must be laid on others, and the work afresh breathed upon, if it appear dry before the whole surface be gilded. When the gold is thus united to the enamel or glafs, by the cementing quality of the gum Arabic, which is used in order to keep it close and even to the body to be gilded, the work is ready for burning.

If the leaf-gold be used for gilding enamel or glafs with the aid of any flux, such flux, being finely levigated, should be tempered with a very weak solution of gum Arabic, and very thinly spread on the part of the work to be gilded; and when the gum water is near dry, the leaf-gold should be laid on the part thus prepared for it; or if the work be kept beyond the time, it must be breathed

upon till it become sticky; the gold thus fixed on the work, it is in a state proper for burning.

The advantage in omitting to use any flux is the rendering the gold less prominent and uneven, with respect to the body gilded, which is in some cases material. But unless the ground, whether of enamel or glass, be very soft, it requires a strong heat to make the gold take hold of it; and this, in the case of enamel, endangers the ground, or any painting upon it; for, if the degree of heat be not very nicely adjusted, the glass or enamel will run into too liquid a state in some instances, and in others not be softened sufficiently to cohere with the gold. The advantage of using a flux lies in avoiding both these inconveniences; and particularly in the case of very hard glass, the being certain that the gold will cake; which is, without this medium, sometimes dubious. But the flux lying under the gold, prevents it necessarily from being so level with the surface, or having the same evenness as when laid on the body itself without any intermedium.

Before we speak of the method of using the gold in powder for gilding in this way, it is proper to mention the manner of preparing this powder, which may be best made in the following manner:

“ Take any quantity of gold, and dissolve it in *aqua regia*, according to the directions given in p. 203, in
 “ the process for making the *calx cassii*, or gold purple.
 “ When it is dissolved, make a precipitation of the gold,
 “ by putting into the solution slips of copper-plate, which
 “ must be continued there till they no longer produce
 “ any effervescence in the fluid. These slips of copper
 “ being then taken out, and the gold adhering to them
 “ gently beaten off, the fluid must be poured off from the
 “ precipitate, and fresh water put into its place, which
 “ must be renewed in like manner several times, till the
 “ salt formed by the copper and *aqua regia* be entirely
 “ washed from the gold; which being dried will be ready
 “ for use.”

The precipitation may otherwise be made by adding a solution of Roman vitriol, or of copperas, or common green vitriol, to the solution of gold, as was above directed p. 293; and, indeed, this method is more expeditious, as the precipitation is instantaneously made. In the present practice, the *aurum fulminans*, or precipitation by al-

kaline salts, is made by those who gild glass in the greatest perfection of any here, and the volatile alkali is employed for the precipitation by the chemist who prepares it for this purpose; but when this kind of precipitate is chosen, the use of any flux must be avoided; and a very considerable degree of heat applied.

Where it will not answer the trouble to prepare precipitated powders, that formed of leaf-gold, in the manner below taught, may be used in its place; but the precipitates are more impalpable powders than can be obtained by any different method; and will take a finer burnish than any other kind, when employed in this sort of gilding.

The manner of using the precipitates of gold in gilding of glass or enamel, except with respect to the *aurum fulminans*, may be varied two ways as well as that of the leaf-gold, viz. by adding to it, or omitting any flux. The convenience of using flux is the same with that before mentioned, with the further advantage of rendering the gilding extremely durable, even to a degree of bearing to be scraped; but the disadvantages are greater; for not lying under the gold, as in the other case, but being mixt with it, the flux destroys the rich metalline look, and, what is still much worse, in many cases prevents its taking a burnish with the true lustre.

In which way soever the powder is used, it is to be tempered with the oil of spike, and worked as the enamel colours, and the quantity of flux, when any is used, may be a third of the weight of the gold. When the gold is thus laid on, the work is ready for burning, which operation must be performed in the same manner, excepting what regards the degrees of heat in all the different methods of gilding that have been here mentioned.

In cases where the glass is very hard, or where the opportunity of a strong heat cannot be conveniently obtained, the expedient of using a flux in the following manner may be adopted with great advantage.

“Grind glass of borax to a fine powder, and, having tempered it with oil of spike, lay it on the glass where the gilding is to be made. Burn then the glass with the degree of heat that will run the borax, and when it is cold apply the precipitate, or leaf-gold, and burn it again as in other cases.”

In this manner the advantage of a flux may be gained, without the inconveniences before-mentioned; and the gold will take with a very gentle heat. It is, indeed, attended with double trouble and hazard; but in the case of using leaf-gold, where a very good burnish may be wanted, this method will perhaps be found, on the whole, the most eligible.

The manner of proceeding for burning or annealing the work in this kind of gilding is the same with the treatment of the enamel, or glass in the use of the colours, except that the pieces may either be put into the muffles or coffins; or, in the case of the glass, if there be no painting, the operation may be performed in the naked fire.

After the work is burnt, if it be designed to be burnished, a proper lustre may be given to it by rubbing the gilded part with a dog's tooth, or with a fine agate, or iron burnisher.

CHAP. XIII.

Of the taking off Mezzotinto Prints on Glass, and Painting upon them with Oil, Water, or Varnish Colours.

THE painting on glass by means of mezzotinto prints, is performed by transferring the ink of the print to the surface of a glass; and thus, having obtained a drawing, colour it by proper pigments tempered with oil, varnish, or oil of a vehicle. This transferring the ink from the print to the glass is effected by cementing the face of the prints to the surface of the glass, by means of some glutinous body which will not dissolve in water, and then destroying the texture of the paper by water, so that it may be rubbed entirely off from the cement upon the glass, leaving, at the same time, the whole of the ink of the print upon the cement and glass, in the same manner as if the original impression had been made there.

The particular method of performing this is as follows:

Procure a piece of the best crown-glass, as near as possible in size to the print to be taken off, and varnish it thinly over with turpentine, rendered a little more fluid by the addition of oil of turpentine. Lay the print then on the glass, beginning at one end, and pressing it gently down in every part in proceeding to the other. This is requisite to prevent any vesicles of air being formed in the laying it on, by the paper touching the cement unequally in different parts, and to settle the whole more closely to the glass, it is well to pass over it a wooden roller of about the diameter of two inches; dry then the glass, with the print thus laid upon it at the first, till the turpentine be perfectly hard, and afterwards moisten the paper well with water till it be thoroughly soaked. After this, rub off the paper entirely from the cement, by gently rolling it under the finger, and let it dry without any heat; the impression of the print will be found perfect on the glass, and may be painted over with either oil or varnish colours.

The choice and treatment of the colours for painting in this way upon glass, in either oil or varnish, may be the same as for any other methods, and it is therefore needless to enumerate any further particulars, but to refer to the parts of this work where the nature and preparation of them, as well as the manner of composition with the oils and varnish, is before explained.

CH A P. XIV.

Of Colouring or Washing Maps, Prints, &c.

THE colouring maps, or other prints, is performed either by spreading opaque colours so thinly on the subject that the full effect of the printing may appear under them, or by using transparent colours, which stain the ground and dry away without leaving any opaque body. This last method is called *washing*.

The using opaque colours, or such as have a solid body, in this way on prints, depends entirely on the kind of vehicle used; for if the colour be suspended by the vehicle, that it can be spread so as to lie in the most sparsed, and

yet equal manner, it may be applied to this purpose with success, and such as are very strong and bright, even tho' of the most opaque body, as vermilion, verditer, ultramarine, or turpeth, mineral, will answer the end. The best method of doing this is the using the isinglass size, as I before intimated, prepared with sugar or honey, according to the directions given in p. 180, which makes the colours of this sort work so freely, that they may be diffused almost as easily as the transparent kinds, and with nearly as good effect. The proportion of the strength of the size to each particular sort is likewise before-mentioned in p. 185, and it is therefore unnecessary to give it here; but it is proper in most cases to dilute the composition more for the washing maps, and spreading the colour over large surfaces, than when employed in painting.

Besides the opaque, there are a number of colours which are semi-transparent, and yet have a body in a greater or less degree. These are carmine, bistre, and gall-stone, in the first degree, with lake and Prussian blue in the second; all which may be treated in the same manner, but require very different proportion in the strength of the size; for the first of these classes ought to have as little as possible of the size, and the latter to be more copiously furnished with it.

The transparent colours should be preferred for this purpose to either of the other kinds, as their effect is better, and they require no preparation. The colours are;—*for red*, red ink; *for blue*, litmus; *for green*, sap green and verdigrise (in vinegar); *for yellow*, gamboge, the yellow berry wash, and tumeric wash; *for purple*, the log-wood wash, and archal; *for brown*, Spanish liquorice; and *for black*, Indian ink. These require only to be dissolved in water, which should be more copiously added where they are employed for washing prints, or colouring large grounds of any ground.

With respect to the manner of using any of these classes in the colouring maps and prints, there is nothing more required than in any other painting, except that it must be carefully observed, in employing the opaque or semi-transparent colours, never to cover any parts so strongly with them as to prevent the distinct appearance of the shades of the printed design, as they are to shew themselves

through the colours, and form the shades of the picture made by the colouring.

In the *illuminating* (as it is called) maps, as little peculiar in the manner is necessary as in the case of other prints; only, the intent of colouring them being to distinguish the divisions of the maps with respect to countries, districts, &c. care must be taken not to lay the fluid colours on so copiously as to flow beyond the limits of what they are intended to cover. The rest depends on the disposing of the variety of colours so in different parts as to give them a strong and pleasing effect, which must depend more on fancy and good taste than on any rules. There is indeed one thing in particular, which it may be proper to remark, should be always avoided; it is the laying those colours that have any affinity or likeness close to each other; for by an error in this particular they will be rendered much less effectual with respect to the purpose they are to serve, as it is by such a disposition made more difficult to the eye to distinguish the limits and bounds they are intended to mark out. And moreover, for want of due apposition, the diversification of the colours is made less pleasing when they are seen at a distance, and considered only with respect to their ornamental appearance. There is one other rule I will likewise recommend the observance of, though many think they are giving most perfection to their work when they most deviate from it; it is, the never using too strong and deep colours for this purpose, as they render the legible characters of the maps less distinct and perceptible. Such a practice is therefore repugnant in a certain degree to the principal intention of the maps, and moreover gives them a tawdry glaring appearance, which is very inconsistent with good taste; one great principle of which is simplicity, and the avoiding a false and unmeaning shewiness.

P A R T II.

Of the several Arts used in making outline Sketches of designs from Nature, or depicted Representations, and of the means of taking casts and impressions from Figures, Busts, Medals, Leaves, &c.

C H A P. I.

Of the Devices employed for the more easily obtaining a just Outline in making designs from Nature, and the various methods of off-tracing, calking, and reducing Pictures, Prints, or Drawings.

THE drawing accurately and readily after nature, and depicted representations, by the unassisted hand and eye, requires greater practice and command of pencil than fall to the share of many, who, nevertheless, may not want abilities to colour or shade a picture or drawing when a proper outline sketch is previously procured. The convenience of quicker despatch is moreover a matter of importance even to those who are most expert in this art. On these accounts, various means have been devised to lead and direct the eye or hand, in forming just outlines of the principal objects which compose the design. These means consist of a multiplicity of methods, founded on different principles.

In the drawing after nature, the interposing a transparent plane is commonly practised; through which plane the objects being seen from a fixed point of view, the out-

lines of their parts are traced upon it by chalk or some kind of crayon; or such transparent body is divided into squares, through which the objects being viewed, the eye may be enabled to form and dispose them with more certainty, on a paper or other proper ground, divided into a similar number of squares; or some reflected image is obtained by means of a *camera obscura*, which affords an opportunity both of drawing the figure, and imitating the natural colour of the objects. These are the devices employed for drawing after nature; but where pictures, prints, or drawings, are to be copied, a much greater variety are used. The most common method is by *off-tracing*, as it is called, which is the laying some transparent substance over the picture, print, or drawing, and passing over the outlines of the principal parts with a pencil or crayon, which delineation is to be afterwards transferred from this transparent body to the ground intended for the painting or drawing. The second method, which is indeed only another kind of *off-tracing*, practised sometimes in the case of prints and drawings, is effected by laying the originals on the ground of paper or vellum designed for the copy, the back of the original being smeared with black, or with vermilion, mixed with a little butter, or a paper so prepared being laid betwixt the original and copy, and tracing over the principal parts of the design with a needle, or some other such like instrument, by which means an outline sketch of it will be formed on the ground of the copy. This method is called *calking*, and is performed also in another way, by puncturing or pricking the original print or drawing, and producing an outline on a new ground, by transmitting a coloured powder through the punctured holes. The third is by dissolving part of the printing ink by means of soap, and impressing it on a fresh ground in that state. Another method much practised, is the using squares in the manner above spoken of, in the expedients for drawing after nature, except that here they are to be laid upon the picture. This method is likewise applied to the more certain copying of pictures or drawings, where the new design is to differ in magnitude from the original, in which case it is called *reduction*. For the answering this last purpose, there is likewise another method, by means of a machine I shall below describe, for *off-tracing*, in a manner, where, by simply drawing over

the lines of the original, the new sketch may be made greater or less at pleasure.

The particular manner of using the transparent plan for taking designs from nature, is, by framing a piece of tiffany or fine lawn of the size of the picture or drawing intended, and fixing it so that the whole view of what is to be painted may be seen through it; a sight-board, that is, a flat piece of wood, with a hole in it, being placed parallel to the tiffany or lawn in such manner, that the eye may command the whole view through it, at the same time that the hand may reach with convenience to draw upon it. The outlines of the object as they appear through the hole in the sight-board, must then be traced out on the tiffany or lawn, by a crayon formed of white or red chalk, charcoal, or any proper substance, by which means a sketch of the design will be produced. In order to form a more complete drawing from this crude sketch on paper or vellum, the tiffany or lawn containing it must be carefully laid on such paper or vellum in an horizontal position, and, being well fixed down upon it, must be struck with some flat body in every part; by which means the chalk or matter of the crayon will be transferred from the old to the new ground, and produce the same delineation of the object upon it as was before on the other. The impression, thus made on the new ground, should be then over-traced with a black lead pencil, and afterwards corrected, if there be occasion, from the natural view through the sight-board, and this paper or vellum will then contain a proper outline drawing, if the design was intended for a painting in water colours. But when this method is pursued with a view to a painting in oil, the tiffany or lawn, after the sketch is drawn, must be laid upon the ground of the intended picture, and proceeded with in the same manner as with the vellum or paper, only in this case the over-tracing must be made with some kind of crayon instead of the black lead pencil.

It is advised by some to use paper made transparent by means of oil of turpentine, instead of the tiffany and lawn; but the use of it is only practicable in this way in a darkened room, or other confined place, and the paper thus prepared does not become transparent enough, even then, to shew minute or remote objects so distinctly as is necessary. If, however, any choose to use it, the usual prepa-

ration of the paper is only to brush it several time over with oil of turpentine, and to suffer it to dry. The transparency will be much improved, if a third of nut or poppy oil be added to the oil of turpentine, or otherwise a little crude turpentine or colourless varnish, any of which will render the oil of turpentine more efficacious for this purpose, and save the trouble and expence of rubbing the paper so often over as is otherwise necessary. The paper employed for this purpose should be that called *fan-paper*, which is to be had of the fan-makers; or, if that cannot be procured, fine post paper may be substituted; and where the design is too large to be contained in one sheet, several may be joined together, by laying the edges of the sheets a very little over each other, and cementing them by isinglass glue, which, if neatly done, will affect the transparency in the joints but in a very minute degree. When the original sketch is made on transparent paper, the tracing or drawing may be performed by a black lead pencil instead of a crayon, which renders the drawing much more perfect and durable; and, being thus completed, it may be used for off-tracing the sketch on any ground intended for a painting in either oil or water. If it be intended for a picture in oil colours, the back of the paper may be smeared with pounded black lead, charcoal dust, or any powdered crayon; or, what is much better, vermilion mixed with just so much butter as will make it adhere to the paper. It must then be laid on the ground of the picture, and over-traced by a copper or iron stiff, or blunted needle, which will make an impression of the sketch on the ground, by means of the colour on the back of the paper; or another paper may be coloured with the black lead or vermilion, instead of the black of the transparent paper, and being laid betwixt that and the ground will answer the same end. The means are no way different where the sketch is to be transmitted to paper instead of oil. But in colouring the back of the transparent paper, or that interposed where any such is used, care should be taken that the colour be so wiped off as not to smear the ground, or produce any effect, except where compressed by the instrument in the over-tracing, and this indeed should be regarded to a certain degree even with the oil ground. Where the sketch is large and made on several sheets of paper, it is convenient to have weights

to place on the four corners of the conjoined sheets, to keep them even and steady on the ground. They are best formed of square pieces of lead with handles, and may be about two or three pounds weight each.

The sketch or transparent paper may be otherwise transmitted to any ground by puncturing it with holes made near each other in the lines of the drawing, and then fixing it on the ground, and dusting over it black lead or any other coloured matter finely powdered, and tied up in a fine linen cloth. This dust passing the holes of the pricked paper, will delineate the sketch on the new ground, so that it may then be over-traced by any kind of pencil or crayon. Glass has been also used in the same view as the lawn or transparent paper; but its texture hinders it from being well managed with chalk, or any crayon or pencil; though there is a method that has not, as far as I know of, been hitherto practised, by which a sketch might be well obtained by the use of glass. This method is, by drawing the outlines of the objects with black colour in drying oil, and, when the sketch is finished, laying the paper intended to receive the copy gently, and without any rubbing or shifting on the glass, having first moistened it with water; by which means the black paint will be transmitted to the paper, as the moisture exhales from it, and an impression made sufficiently exact for the purpose.

The manner of assisting the eye, in designing from nature by means of a plane divided into squares, is by drawing cross-lines parallel to each other on a tiffany or lawn framed, or on transparent paper or glass. This may be done with common writing ink, or any other way that will render the lines visible, and the divided plane must be then placed before the sight-board in the same manner as was before directed for tracing the outlines. The ground on which the sketch is intended to be taken must be also formed into an equal number of squares, and the objects being seen through the squares of the transparent plane, will by this means be much more easily disposed in their proper situation, and formed of a just magnitude, by placing them in the correspondent square of the ground, than where the eye had no such medium to compare and judge by. But though the above substances are most commonly used, there is a more simple and effectual way of doing this, which is by making a frame of a proper size, and dividing the area, which it forms into

squares, by threads of a moderate thickness. In which way, the objects to be drawn are consequently more within the power of the eye than when the most transparent body is used. The drawing by the assistance of squares, to those who have the least command of hand, is by much the most expedient way. But in order to render this, or the other methods more commodiously practicable, where it is to be done in the open air, a portable machine should be made for supporting the frame of the transparent plane and the sight-board. This machine may be constructed by joining three long legs together, in the manner of the surveyors' instruments, in a block, and fixing the frame, by means of a foot which will slide into the same box, that it may be raised higher or lower. The sight-board must have a foot likewise, by which it may be raised higher or lower; though this must not be fixed into the block, but into a sliding-piece, which must pass through the block horizontally; so that the foot of the side-board being fixed into it at right angles, the board may be brought nearer to, or drawn farther from the transparent plane at pleasure.

The second method used to facilitate the drawing after Nature, to wit, by the reflected image of the object, is performed by the *camera obscura*, of which a portable kind adapted to this purpose is commonly made by the opticians. It is needless, therefore, to give any description of these instruments; and the structure of them immediately explains the manner of their use on a very slight examination. Where they are not at hand, and a prospect through any particular window is desired to be taken, an occasional camera may be formed. This is to be done by boring a hole through the window-shutter at a convenient height, and putting one of the glasses, called the ox-eye, into the hole; when, all other light being shut out, except that passes through this hole, and a proper ground of paper or vellum, &c. being held at a due distance from the hole, the reflected image of the prospect will be formed upon the ground. If this ground be formed of paper, and fixed steady by a proper frame, the image will appear very perfectly on the reverse or backside of it, and the artist may stand at the back and trace the outlines of the necessary parts with great convenience, and may even stretch the colouring, if he thinks it expedient. Though the taking views of nature by the camera has several convenien-

ces, and seems very advantageous, yet there is one very material objection to its use. This is, that the shadows lose their force in the reflected image; and objects, by the refraction, are made to appear rounder, or different sometimes both in their magnitude and site, from what they really are, which being oppugnant to the truth of any drawing, almost wholly destroys the expedience there would be otherwise found in this manner.

The method of making sketches of outlines from pictures, prints, or drawings, by off-tracing, is performed by a variety of methods. The most common, where the size of the painting does not forbid it, is to take a sheet of paper prepared by oil of turpentine, or the other means as above directed for the taking views from nature; and having fastened it even on the picture or print to be copied, to trace over the principal parts with a black lead pencil. By this means an outline being obtained, it may be imparted to any other ground, in the manner before described, when the same kind of outline is formed by drawing after nature. Where larger pieces are to be copied, lawn and tiffany may be used instead of the transparent paper; or several sheets of the paper may be joined together by the means of isinglass glue; and when the outline is traced by chalk, or other proper crayon, the subsequent proceeding may be the like also; in this case, as above where the same kind of outline is taken from Nature Goldbeater's skin and horn, as prepared in plates for lanterns, as also the tale or fessible isinglass, and dried hog's bladder, have been likewise applied to this purpose. But where horn or isinglass are used, being rigid bodies that will not yield to impart an impression by retracing, they may be best treated in the manner above advised, in the case of glass, when employed for taking views from Nature; which is, by tracing the outlines with black in oil and printing a new ground of paper with it.

Another common method of off-tracing, in the case of prints, or drawings, is to fix them against a window, or other hard transparent body placed in a strong light, in perpendicular position; and put a piece of paper, vellum, or any other body sufficiently transparent, before them, to perform the off-tracing, by the view which is thus given of the objects in the print or drawing.

The other method of off-tracing, called *calking*, which is sometimes practised in the case of prints and drawings, is performed by tracing on the print, or drawing itself, instead of the transparent body laid over it, as in the other manner. The back of it must be previously prepared, by rubbing it over with black lead powder, or other such matter; or a paper blacked on the under side may be used instead of blacking the print or drawing. By either of these methods an outline will be made on any ground of vellum or paper laid under the print, and if several grounds of very thin paper be laid together under the print, with each a blackened paper over them, so many impressions may be made at one time. The same effect may be produced by puncturing or pricking out the proper outlines in the print or drawing, and then using it for imparting the sketch to another ground, with the black lead powder, &c. in the manner above described in speaking of the use of the oiled paper. When the print or drawing is thus prepared by puncturing, it may be employed for transmitting the sketch to any number of grounds.

The manner of using soap, for taking off the impression of a print on a new ground, is this: Smear the original over with the common soft soap, commixed with water till it be of the consistence of a thin jelly, and then lay it even on the ground intended to receive the impression, which must be also previously moistened with water. After which, being covered with several other papers, the whole must be compressed, by passing a wooden roller over them, or by rubbing strongly on them with the calender glass used for glazing linen, or by any parallel means. The impression of the original will by this means be imparted to the new ground; which must be first dried, and then carefully washed with a sponge and water to take off the soap. It has been said by some, that this treatment will do very little injury to the original print; but, besides the impracticability of ever thoroughly cleansing it from the soap, a part of the printing ink is taken from it, and a proportionable share of the effect of the original impression destroyed.

A method parallel to this is sometimes used with prints and drawings; which is, by holding them up to the light, and tracing the proper outlines on the back with a black

lead pencil, or any kind of crayon, and then laying the traced side on a ground proper to receive the impression, going over them with a roller or calender glass, in the same manner as when the impression is taken by means of soap. On the same principle, in the case of compartments, cyphers, or any other regular figures, where both sides are alike, when one half is drawn or traced, the other half may be procured by doubling the paper exactly in the place where the two halves should join, and then pressing or rolling over the outside of the sketched part; by which treatment a correspondent impression of the design will be made on the other side, and the whole sketch will be finished without the trouble of drawing or tracing out the second half.

The method of copying designs by the use of the squares, either in order to paint in equal magnitude, or with a view to reduction, is thus: Divide the original into a convenient number of squares, by ruling lines across it with any kind of crayon, and then do the same on the ground, in a correspondent manner. The squares on the new ground may be either increased, diminished, or made equal as to their size, with respect to those of the original, according to the intended proportion of the new piece. The principal use of the squares, in this case, is so much the same as when they are applied to the taking drawings from Nature, that it is needless to dwell longer on them now. I shall only intimate, that, to those who can draw at all, the use of the squares is much more adviseable here, as well as in drawing after Nature, than any of the other methods; as it is much more improving, and on the whole less troublesome, to make a correct sketch this way than by any other.

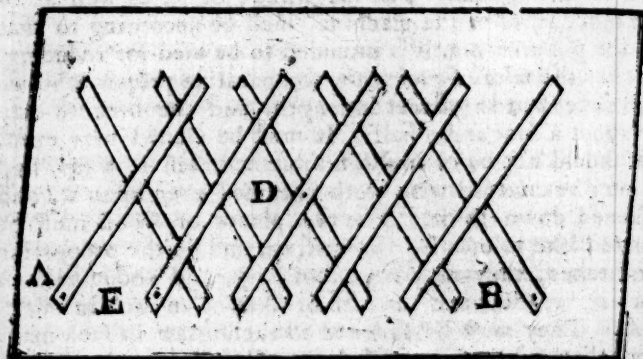
The manner of reduction, or, if that be not necessary, of tracing out an outline, where the magnitude of the original is to be preserved, by the machine above-mentioned, which was formerly called a *parallelogram*, and by some at present a *mathematical compass*, cannot be shewn without first describing fully, or exhibiting by a figure, the construction of the instrument. I shall therefore endeavour to explain the structure and manner of fabrication of it, as well as those of a machine somewhat complex admit; and what may escape the conception in the verbal descrip-

tion, may be supplied by the inspection of the figure annexed.

This instrument is composed of a board, or table, with ten pieces of wood fixed upon it, in a moveable manner; and by such a construction, that when one is moved, the whole of the rest move also similarly, with respect to the directions, but under greater or less angles. The board or table may be of fir deal, and is usually made in the form of a parallelogram. The magnitude of it, as well as of the other parts of the machine, must be according to that of the pictures, &c. it is intended to be used for reducing. But for the sake of giving the comparative proportions, we will state it at three feet in length, and the breadth may be about a foot and a half. It must be planed very even, but should not be of too thin substance, lest it warp, and it must be covered with cloth stretched even upon it, and fastened down to it. The ten pieces of wood must be formed like rulers used for writing, and, in the proportion here taken, they may be a foot long, and about half an inch in breadth, and the fifth or sixth of an inch in thickness. They must be fastened to each other in such manner, that every one must be crossed by another in the centre, and by two others at such distance from the centre as exactly divides the two half lengths on each side of it; except the two which form the extremities, and can be only crossed in the centre and in the middle of one part, which, in each extremity, will be the part opposite to that so crossed in the other, as will immediately appear on the pieces being laid together in the position here directed. The fastening must be by pins, or rivets, on which each piece may be turned with perfect freedom; and near each end of every piece must be made a hole or a female screw, into which a crayon, port-crayon, or pencil may be fixed, either by or without a screw. At the ends of those pieces which make the extremities, there must be a smaller hole for a pin to be passed through to fasten the conjoined pieces to the board. In order to the more commodiously fixing the several parts of the instrument to the board or table, it may be proper to have female screws at the places of the table where the rulers are to be pinned down, according to the different applications of the instrument; and the pins for fastening the respective parts must, in this case, have male screws at their extremities, corresponding to the

female screws in the table. By these directions closely followed, the parts of the instrument may be completely formed and put together; but to explain the manner of using it, the figure is here given, as it is more easy to refer to the parts of that, than to such as have only a verbal specification.

Let the leg or extremity of the piece *A* be fastened to the board in the part of it as here delineated, and let the



picture, &c. be placed under the end of the piece *B*, a strong pin blunted, or other such rigid body being put through the end of it, and placed in the centre of the picture, or any other part where it may be convenient to begin the tracing. Let the ground intended to receive the drawing, or sketch, be then placed at *E*, the next leg to that fastened to the board, if the design of the original be intended to be diminished in the utmost degree the machine can effect, or to any of the other legs nearer to the original, according to the proportion of the diminution required. A crayon, or pencil, must then be fixed in the hole of the piece *E*, made for that purpose, and must rest on the ground of the sketch, which ground must be so placed, that the crayon or pencil may be immediately over the part of it which corresponds with the part of the original touched by the blunted pin. The picture and ground of the sketch must then be fastened firmly to the board, and the artist bearing with his left hand gently on the crayon or pencil over the ground, must trace, with the

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blunted pin or stift fixed in the hole of the most distant leg, the outlines of the original, which will so move the crayon or pencil on the ground for the sketch, that a correspondent line will be marked there, but with the diminution of the design in the proportion desired.

When the enlargement of the original is desired, the reverse must be practised with regard to the situation of the original and copy; for if the original be placed under *E*, the piece next to that fastened to the board, and the new ground be put under *B*, the end of the leg where the original was before placed, the subsequent management being the same as before in all other respects, the sketch will be augmented in an equal degree to what it was diminished before.

If a sketch of equal magnitude be desired, the fastening of the conjoined pieces to the table or board must be at *D*, in the centre of the whole, and the original and new ground placed under the pieces at each extremity, or any other correspondent pieces that may be most commodious.

This machine may be used for off-tracing maps, or other such simpler designs, or may afford amusement by off-tracing pictures, &c. to those who have no facility in drawing. But to the abler and more expert in these arts, where designs that demand spirit and pencil are in question, it seems an expedient below their regard, as performing, by an imperfect mechanical aid, what they can execute better by their own natural powers.

C H A P. II.

Of the means of taking Casts and Impressions from Figures, Busts, Medals, Leaves, &c.

THE method of taking casts of figures and busts, as at present practised, is most generally by the use of plaister of Paris; or, in other words, alabaster calcined by a gentle heat. The advantage of using this substance preferable to others, consists in this, that notwithstanding

a slight calcination reduces it to a pulverine state, it becomes again a tenacious and cohering body by being moistened with water, and afterwards suffered to dry. By this means either a concave or convex figure may be given by a proper mold or model to it when wet, and retained by the hardness it acquires when dry, and from these qualities it is fitted to the double use of making both casts and molds for forming those casts. The plaster is to be had ready prepared of those who make it their business to sell it, and the only care is to see that it is genuine.

The particular manner of making casts depends on the form of the subject to be taken. Where there are no projecting parts, it is very simple and easy, as likewise where there are such as form only a right or any greater angle with the principal surface of the body. But where parts project in lesser angles, or form curves inclined towards the principal surface of the body, the work is more difficult. I shall therefore first explain those particulars of the manner which are general to all kinds, and then point out the extraordinary methods to be used where difficulties occur.

The first step to be taken is the forming the mold, which is, indeed, done by much the same means, as the cast is afterwards made in it. In order to this, if the original or model be a bass-relief, or any other piece of a flat form, having its surface first well greased, it must be placed on a proper table, or other such support, and surrounded by a frame, the sides of which must be at such a distance from it as will allow a proper thickness for the sides of the mold. A due quantity of the plaster, that is, what will be sufficient to cover and rise to such a thickness as may give sufficient strength to the mold, as also to fill the hollow betwixt the frame and the model, must be moistened with water, till it be just of such consistence as will allow it to be poured upon the model. The plaster, thus moistened, must be then put on the model as soon as possible; for it must not be delayed after the water is added to the plaster, which would otherwise concrete or set, so as to become more troublesome in the working, or unfit to be used. The whole must then be suffered to remain in this condition till the plaster has attained its hardness, and then the frame being taken away, the preparatory cast or

mold, thus formed, may be taken off from the subject entire.

Where the model or original subject is of a round or erect form, a different method must be pursued, and the mold must be divided into several pieces; or, if the subject consists of detached and projecting parts, it is frequently most expedient to cast such parts separately, and afterwards join them together.

Where the original subject or model forms a round, or spheroid, or any part of such round, or spheroid, more than one half the plaister must be used without any frame to keep it round the model, and must be tempered with water to such a consistence, that it may be wrought with the hand like very soft paste. But though it must not be so fluid as when prepared for flat-figured models, it must yet be as moist as if compatible with its cohering sufficiently to hold together. Being thus prepared, it must be put upon the model, and compressed with the hand, or any flat instrument, that the parts of it may adapt themselves in the most perfect manner to those of the subject, as well as be compact with respect to themselves. When the model is so covered to a convenient thickness, the whole must be left at rest till the plaister be set and firm, so as to bear-dividing without falling to pieces, or being liable to be put out of its form by slight violence. It must then be divided into pieces, in order to its being taken off from the model, by cutting it with a knife, or with a very thin blade; and, being divided, must be cautiously taken off, and kept till dry. But it must be always carefully observed, before the separation of the parts be made, to notch them cross the joints, or lines of the division, at proper distances, that they may with ease and certainty be properly conjoined again, which would be much more precarious and troublesome without such directive marks. The art of properly-dividing the molds, in order to make them separate from the model, constitutes the greatest object of dexterity and skill in the art of casting, and does not admit of rules for the most advantageous conduct of it in every case. But I shall endeavour to explain the principles on which it depends in such manner, that by a due application of them all difficulties may at any time be surmounted, and an expertness even of manner acquired by a little practice. With respect to the case in question,

where the subject is of a round or spheroidal form, it is best to divide the mold into three parts, which will then easily come off from the model, and the same holds good of a cylinder, or any regular curve figure.

The mold being thus formed and dry, and the parts put together, it must be first greased and placed in such a position, that the hollow may lie upwards, and then filled with plaister commixed with water, in the same proportion and manner as was directed for the casting the mold; and when the cast is perfectly set and dry, it must be taken out of the mold and repaired where it is necessary, which finishes the whole operation.

This is all that is required with respect to subjects where the surfaces have the regularity above mentioned; but where they form curves which intersect each other, the conduct of the operation must be varied with respect to the manner of taking the cast of the mold from off the subject or model; and where there are long projecting parts, such as legs or arms, they should, as was observed before, be wrought in separate casts.

The method of dividing properly the molds cannot be reduced, as I intimated, to any particular rules, but must depend in some degree on the skill of the operator, who may easily judge from the original subjects, by the means here suggested, what parts will come off together, and what require to be separated. The principal of the whole consists only in this, that where *under-workings*, as they are called, occur, that is, wherever a straight line drawn from the basis or insertion of any projection, would be cut or crossed by any part of such projection, such part cannot be taken off without a division. This must be made either in the place where the projection would cross the straight line; or, as that is frequently difficult, the whole projection must be separated from the main body, and divided also lengthways into two parts. Where there are no projections from the principal surfaces, but the body is so formed as to render the surface a composition of such curves, that a straight line being drawn parallel to the surface of one part would be cut by the outline; in one or more places of another part, a division of the whole should be made, so as to reduce the parts of it into regular curves, which must then be treated as such.

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Where detached parts of a long form, as legs, arms, spears, swords, &c. occur in any figure, they should be cast in separate molds, and if such parts are of a compound structure, the same rules as were before intimated must be observed in the management of them, as are already directed for the principal part.

In larger masses, where there would otherwise be a great thickness of the plaister, a corps or body may be put within the mold, in order to produce a hollow in the cast, which both saves the expence of the plaister, and renders the cast lighter.

This corps may be of wood, where the forming a hollow of a straight figure, or such as is conical with the basis outward, will answer the end. But if the cavity require to be round, or of any curve figure, the corps cannot be then drawn while entire, and consequently should be of such matter as will suffer itself to be taken out piece-meal. In this case, therefore, the corps is best formed of clay, which must be worked upon wires to give it tenacity, and suspended in the hollow of the mold, by cross-wires lying over the mouth; and when the plaister is sufficiently set to bear handling, the clay must be picked out by a proper instrument.

Where it is desired to render the plaister harder, the water with which it is tempered should be mixed with parchment-size prepared as below directed, which will make it very firm and tenacious.

In the same manner, figures, busts, &c. may be cast of lead, or any other metal, in the molds of plaister, only the expence of plaister, and the tediousness of its becoming sufficiently dry, when in a very large mass, to bear the heat of melted metal, render the use of clay, compounded with some other proper materials, preferable, where large subjects are in question. The clay, in this case, should be washed over till it be perfectly free from gravel or stones, and then mixed with a third or more of fine sand to prevent its cracking; or, instead of sand, coal ashes, sifted till they be perfectly fine, are preferable. Whether plaister or clay be used for the casting in metal, it is extremely necessary to have the mold perfectly dry, otherwise the moisture, being rarified, will make an explosion that will blow the metal out of the mold, and endanger the operator, or at least crack the mold in such

manner as to frustrate the operation. Where the parts of a mold are larger, or project much, and consequently require a greater tenacity of cohesion of the matter they are formed of to keep them together, flocks of cloth, prepared like those designed for the paper hangings, or fine cotton plucked or cut till it is very short, should be mixed with the ashes or sand before they be added to the clay to make the composition for the mold. The proportion should be according to the degree of cohesion required; but a small quantity will answer the end, if the other ingredients of the composition be good, and the parts of the mold properly linked together by means of the wires above directed.

There is a method of taking casts in metals from small animals, and the parts of vegetables, which, though not much known or used in this country, may be nevertheless practised for some purposes with advantage, particularly for the decorating grottos or rock-work, where Nature is imitated. The proper kinds of animals are lizards, snakes, frogs, birds, or insects; the cast of which being properly coloured will be exact representations of the originals.

This is to be performed by the following method: A coffin or proper chest for forming the mold being prepared of clay, or four pieces of boards fixed together, the animal, or parts of vegetables, must be suspended in it by a string, and the leaves, tendrils, or other detached parts of the vegetables, or the legs, wings, &c. of the animals, properly separated and adjusted in their right position by a small pair of pincers. A due quantity of plaister of Paris, and calcined talc, in equal quantities, with some *alumen pulmosum*, must then be tempered with water to the proper consistence for casting, and the subject from whence the cast is to be taken, as also the sides of the coffin moistened with spirit of wine.

The coffin or chest must be then filled with the tempered composition of the plaister and talc; but, at the same time, a piece of straight stick or wood must be put to the principal part of the body of the subject, and pieces of thick wire to the extremities of the other parts, in order that they may form, when drawn out after the matter of the mold is properly set and firm, a channel for pouring in the melted metal, and vents for the air, which otherwise, by the rarefaction it would undergo from the heat of the me-

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talc would blow it out, or burst the mold. In a short time the plaister and talc will set and become hard, when the stick and wires may be drawn out, and the frame or coffin in which the mold was cast taken away. The mold must then be put first into a moderate heat, and afterwards, when it is as dry as it can be rendered by that degree, removed into a greater, which may be gradually increased till the whole be red hot. The animal, or part of any vegetable, which was included in the mold, will then be burnt to a coal, and may be totally calcined to ashes, by blowing for some time gently into the channel and passages made for pouring in the metal, and giving vent to the air, which will, at the same time that it incinerates the remainder of the animal or vegetable matter, blow out the ashes. The mold must then be suffered to cool gently, and will be perfect, the destruction of the substance of the animal, or vegetable, having produced a hollow of a figure correspondent to it; but it may be nevertheless proper to shake the mold, and turn it upside down, and also to blow with the bellows into each of the air vents, in order to free it wholly from any remainder of the ashes; or, where there may be an opportunity of filling the hollow with quicksilver without expence, it will be found a very effectual method of clearing the cavity, as all dust, ashes, or small detached bodies, will necessarily rise to the surface of the quicksilver, and be poured out with it. The mold being thus prepared, it must be heated very hot when used, if the cast be made with copper or brass; but a less degree will serve for lead or tin. The melted metal must be then poured in, the mold gently struck, and suffered to rest till it be cold. At which time it must be carefully taken from the cast, but without the least force; for such parts of the matter as appear to adhere more strongly, must be softened by soaking in water till they be entirely loosened, that none of the more delicate parts of the cast may be broken off or bent.

Where the *alumen pulmosum*, or talc, cannot be easily procured, the plaister may be used alone; but it is apt to be calcined by the heat used in burning the animal or vegetable from whence the cast is taken, and to become of too incohering and crumbly a texture. For cheapness, Sturbridge clay, or any other potter's or other good clay, washed over till it be perfectly fine, and mixed with an

equal part of sand and some flocks cut small, may be employed. Pounded pumice-stone and plaister of Paris, taken in equal quantities, and mixed with washed clay in the same proportion, is said to make excellent molds for this and parallel uses.

Casts of medals, or such small pieces as are of a similar form, may be made in plaister by the method directed for bas-reliefs. Indeed there is nothing more required than to form a mold, by laying them on a proper board; and, having surrounded them by a rim made of a piece of a card or any other pasteboard, to fill the rim with soft tempered plaister of Paris, which mold, when dry, will serve for several casts. It is nevertheless a better method to form the mold of melted sulphur, which will produce a sharper impression in the cast, and be more durable than those made of plaister.

The casts of medals are likewise frequently made of sulphur, which being melted, must be treated exactly in the same manner as the plaister.

Casts may be made likewise with iron, with very little additional trouble, provided it be prepared in the following manner:

“Take any iron bar, or piece of a similar form, and, having heated it red-hot, hold it over a vessel containing water, and touch it very slightly with a roll of sulphur, which will immediately dissolve it, and make it fall in drops into the water under it. As much iron as may be wanted being thus dissolved, pour the water then out of the vessel, and pick out the drops formed by the melted iron from those of the sulphur, which contain little or no iron, and will be distinguishable from the other by their colour and weight.”

The iron will, by this means, be rendered so fusible, or easy to be melted, that it will run with less heat than will melt lead, and may be employed for making casts of medals, and many other such purposes, with great convenience and advantage.

Impressions of medals, having the same effect as casts, may be made also of isinglass glue by the following means: Melt the isinglass, beaten as when commonly used, in an earthen pipkin, with the addition of as much water as will cover it, stirring it gently till the whole be dissolved; then, with a brush of camel's hair, cover the medal, which

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should be previously well cleaned and warmed, and then laid horizontal on a board or table greased in the part around the medal. Let them rest afterwards till the glue be properly hardened, and then with the pin raise the edge of it, and separate it carefully from the medal; the cast will be thus formed by the glue as hard as horn, and so light that a thousand will scarcely weigh an ounce. In order to render the relief of the medal more apparent, a small quality of carmine may be mixed with the melted iinglass, or the medal may be previously coated with leaf-gold by breathing on it, and then laying it on the leaf, which will by that means adhere to it; but the use of the leaf-gold is apt to impair a little the sharpness of the impression.

There is likewise a method of making impressions of the same kind in lead, which is this: Lay the medal on a post; or other firm body of wood, and cover it with a piece of very thin plate of lead, and lay over that another piece of thicker plate. Then place on them end-ways, a piece of wood turned of a round figure, which may be a foot or more in length, and of such thickness, that its diameter may be somewhat greater than that of the medal. Strike then forcibly on the upper end of the wood with a mallet, or some such instrument, and the undermost plate of lead will receive the impression of the medal; to preserve which, the concave of the reverse may be filled up with resin, mixed with an equal part of brick-dust, and melted. The impression should be made with one stroke, which will produce a sufficient effect, if given with due strength, and in a perpendicular direction. Impressions may be even taken from sealing-wax or sulphur in this manner, if the pieces be no way concave or bending on their under side.

Impressions of medals may be likewise taken in putty, but it should be the true kind made of earth of tin and drying oil. These may be formed in the molds previously taken in plaister or sulphur, or molds may be made in its own substance in the manner directed for those of the plaister. These impressions will be very sharp and hard, but the greatest disadvantage that attends them is their drying very slowly, and being liable in the mean time to be damaged.

Impressions of prints, or other engraving, may be taken from copper-plates by cleaning them thoroughly, and

pouring plaister upon them; but the effect in this way is not strong enough for the eye, and therefore the following method is preferable where such impressions on plaister are desired.

Take vermilion, or any other coloured pigment finely powdered, and rub it over the plate; then pass a folded piece of paper, or the flat part of the hand over the plate, to take off the colour from the lights or parts where there is no engraving. The proceeding must then be the same as where no colour is used. This last method is also applicable to the making impressions of copper-plates on paper with dry colours; for the plate being prepared as here directed, and laid on the paper properly moistened, and either passed under the rolling-press, or any other way strongly forced down on the paper, an impression of the engraving will be obtained.

Impressions may be likewise taken from copper-plates, either on plaister or paper, by means of the smoke of a candle or lamp; if, instead of rubbing them with any colour, the plate be held over the candle or lamp, till the whole surface become black, and then wiped off by the flat of the hand or paper.

These methods are not, however, of very great use in the case of copper-plates, except where impressions may be desired on occasions where printing ink cannot be procured; but as they may be applied likewise to the taking impressions from snuff-boxes, or other engraved subjects, by which means designs may be instantly borrowed by artists or curious persons, and preserved for any use, they may in such instances be very useful.

The expedient of taking impressions by the smoke of a candle or lamp may be employed also for botanical purposes, in the case of leaves; as a perfect and durable representation of not only the general figure, but the con-texture and disposition of the large fibres, may be extemporaneously obtained at any time. The same may be, nevertheless, done in a more perfect manner by the use of linseed oil, either alone, or mixed with a small proportion of colour, where the oil can be conveniently procured. But the other method is valuable, on account of its being practicable at almost all seasons, and in all places, within the time that the leaves will keep fresh and plump. In taking these impressions, it is proper to bruise the leaves,

so as to take off the projections of the large ribs, which might prevent the other parts from plying to the paper.

Leaves, or also the petals, or flower leaves of plants, may themselves be preserved on paper, with their original appearance, for a considerable length of time, by the following means: Take a piece of paper, and rub it over with the isinglass glue, treated as above directed for taking impressions from medals; and then lay the leaves in a proper position on the paper. The glue laid on the paper being set, brush over the leaves with more of the same, and that being dry likewise, the operation will be finished, and the leaves so secured from the air and moisture, that they will retain their figure and colour much longer than by any other treatment.

Butterflies, or other small animals of a flat figure, may also be preserved in the same manner.

P A R T III.

Of Gilding, Silvering, Bronzing, Japanning, Lacquering, and the Staining different kinds of Substances, with all the variety of Colours.

C H A P. I.

Of Gilding.

SECT. I.

Of Gilding in general.

THE gilding different substances is performed by a variety of means accommodated to the nature of each; but the principle is the same in all, (except with respect to one kind practised on metals, where quicksilver and heat is used, which I omit here as not properly a part of the subject of this work) being only the putting some proper cement on the body to be gilt, and then laying the gold either in the form of leaves or powder on the cement, which binds it to the body.

The principal kinds of gilding are those called *oil gilding*, *burnish gilding*, and *japanner's gilding*, or *gilding with gold size*. These may be promiscuously used on grounds either of wood, metal, or any other firm and rigid body; but paper and leather require a treatment, in some cases, peculiar to themselves.

The first attention in most kinds of gilding is the choice of leaf-gold, which should be pure, and of the colour accommodated to the purpose, or taste of the work. Purity is requisite in all cases; for if the gold be allayed with silver it will be of too pale and greenish a hue for any application, and if it contain much copper, it will in time turn to a yet much stronger green. The purity may be ascertained with accuracy enough for this purpose by the touchstone and *aqua fortis*, and the fitness of the colour to any particular purpose may be distinguished by the eye. The full yellow is certainly the most beautiful and truest colour of gold; but the deep reddish cast has been of late most esteemed from the caprice of fashion. Whichever may be chosen, the colour ought nevertheless to be good of the kind; for there is a great variation in the force and effect of different parcels of the same teint, some appearing more foul and muddy, others bright and clear.

The best method, however, of judging of the colour of leaf-gold with nicety, is by keeping a specimen of such as is perfect, with which any fresh parcel may be occasionally compared.

There is, besides the true leaf-gold, another kind in use, called Dutch gold, which is copper gilt, and beaten into leaves like the genuine. It is much cheaper, and has, when good, greatly the effect of the true at the time of its being laid on the ground; but, with any access of moisture, it loses its colour and turns green in spots, and, indeed, in all cases its beauty is soon impaired, unless well secured by lacquer or varnish. It is nevertheless serviceable for coarser gilding where larger masses are wanted, especially where it is to be seen by artificial light, as in the cases of theatres, and, if well varnished, will there in a great measure answer the end of the genuine kinds.

The other preparations of gold belonging to particular kinds of gilding, I shall treat of them, as likewise the cements or other substances employed, in their respective places, and proceed now to shew what the instruments are which are common to the three principal methods.

SECT. II.

Of the Instruments that are common to the Oil, Burnish, and Japanner's Gilding,

THE first necessary instrument is a cushion for receiving the leaves of gold from the paper, in order to its being cut into proper size and figures for covering the places to be gilt. This cushion should be made of leather, and fastened to a square board, which should have a handle. It may be of any size, from fourteen inches square to ten, and should be stuffed betwixt the leather and board with fine tow or wool, but in such a manner that the surface may be perfectly flat and even.

A proper knife is the next, and an equally requisite instrument, as it is necessary in all cases to cut or divide the gold into parts correspondent to those which are to be covered. This knife may be the same in all respects as those used in painting, called *palette knives*, the blade of which may be four or six inches long, and somewhat more than half an inch in breadth, with a handle proportionable.

A squirrel's tail is likewise generally provided for taking up the whole leaves, and for compressing the gold to the surface where it is laid, and giving it the position required. It is used also by some for taking up the parts of leaves; but this is better done by means of a ball of cotton wool, which will both answer this end, and that of compressing the gold in a more easy and effectual manner. This squirrel's tail is cut short, and sometimes spread in a fan-fashion by means of a piece of wood formed like a pencil stick, but broad at one end, and split to receive the tail; but it will equally serve the purpose of its own form when the hair is cut to a proper length. This instrument is by some called a *palette*, but improperly, as the board for holding the colours in painting, and which is frequently in use along with this, being called by the same name, would necessarily produce a confusion in speaking of either.

A brush of very soft hog's hair, or of the fitch kind, made large, is likewise commonly used for passing over the

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work when it is become dry, in order to take off the loose gold.

Some fine cotton wool is also necessary for taking up the smaller parts of the leaves, and laying them on the work, as also for compressing and adjusting them when laid on. The cotton should be formed into a ball by tying it up in a piece of fine linen rag; for, if it be used without the rag, the fibres adhere to the gold size, and embarrass the work.

A small stone and mullar, with a proportionable palette knife, are required for grinding and tempering the mixtures made of the fat-oil, or gold-size, with each other, and the colours that may be added to them. Proper brushes are also wanted for laying on and spreading the fat oil, or size, on the work, and some of these should be fitches of different sizes, in order to convey and settle the gold where the relief of carved work forms deep hollows.

These are all the instruments that are common to all the three principal kinds of gilding; such as are peculiar to each, I shall take notice of where they more properly occur.

SECT. III.

Of the manner of Oil Gilding, and the preparation of Fat Oil.

THE gilding with oil is the most easy and cheap, as well as most durable kind, and, therefore, is mostly applied to common purposes. It is performed by cementing the gold to the ground by means of fat oil. The preparation of which is, therefore, previously necessary to be known, and may be much better managed in the following manner than by any method hitherto taught, or commonly practised.

“ Take any quantity of linseed oil, and put it into an earthen, or any other vessel of a broad form, so that the oil may lie in it with a very large surface; but the proportion should be so limited that the oil may be about an inch thick in the vessel. The earthen pans used for milk in the forming cream for butter are very well accommodated to this purpose. Along with the

“ oil as much water should be also put into the vessel as
 “ will rise six inches or more above the bottom. Place
 “ the vessel then, with the oil swimming on the water, in
 “ an open place where the sun and rain may have access
 “ to it, but where it may be as free from receiving dust
 “ and filth as possible. Let it stand in this condition, stir-
 “ ring the contents on every opportunity, for five or six
 “ weeks, or till it appear of the consistence of treacle.
 “ Take the oil then from off the water into a phial, or
 “ bottle of a long form, or, what is better, into a sepa-
 “ rating funnel, such as is used by the chymists, and there
 “ draw off the remainder of the water. Place it after-
 “ wards, being in the long bottle or phial, in such heat
 “ as will render it perfectly fluid, and the foulness it may
 “ contain will soon subside to the bottom, when the clear
 “ part must be poured off, and the remainder strained
 “ through a flannel, while yet warm, and the whole will
 “ then be fit for use.”

It is to be observed, that this method is only practi-
 cable in summer, as the sun has not sufficient power in win-
 ter to produce a due change in the oil.

This method differs from that commonly practised in
 the addition of the water, which suffers the foulness to
 separate from the oil and sink to the bottom, where it re-
 mains without being again mixed with the oil every time
 it is stirred, as is unavoidable where no water is used.
 The water likewise greatly contributes to bleach the oil,
 and improve it in other respects.

The best previous preparation of the piece to be gilded,
 if it have not already any coat of oil paint, is to prime it
 with drying oil mixed with a little yellow ochre, to which
 also a very small proportion of vermilion may be added.
 But where greater nicety and perfection is required in the
 work, the wood should be first rubbed with fish-skin, and
 then with Dutch rushes.

This priming being dry, the next part of the operation
 is the sizing the work, which may be done either with the
 fat oil alone, (but diluted with drying oil, if too thick to
 be worked without) or with fat oil and the japanner's gold
 size, (of which the preparation is below taught) either in
 equal quantities, or in any less proportion, with respect to
 the gold size. The difference betwixt the use and omis-
 sion of the gold size, in this way of gilding, lies in two

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particulars: The one is, that the sizing dries faster according to the proportion of the quantity of the gold size to the fat oil, and is consequently so much the sooner fit to be gilded. The other is, that the gilding is also rendered, in the same proportion, less shining and glossy, which is esteemed a perfection in this kind of gilding; though, taking away the prejudice of fashion, I shall think the most shining the most beautiful, and of the strongest effect.

The fat oil, or the compound of that and the gold size, must be ground with some yellow ochre, and then, by means of a brush, laid thinly over the work to be gilt. But, in doing this, care must be taken to pass the brush into all the hollows and cavities, if the subject be carved, or have any other way projecting parts. For where the size fails to be laid on, the gold will never take till the work be again repaired by going over the defective places with fresh size, which should be avoided as much as possible. Where great perfection is required, the gold should not be laid on the first sizing; but that being suffered to dry, the work should be again sized a second time, and some who are very nice even proceed to a third.

The work being thus sized, must be kept till it appear in a proper condition to receive the gold, which must be distinguished by touching with the finger. If it appear then a little adhesive or clammy, but not so as to be brought off by the finger, it is in a fit condition to be gilt. But if it be so clammy as to daub or come off on being touched, it is not sufficiently dry, and must be kept longer; or, if there be no clamminess or sticky quality remaining, it is too dry, and must be sized over again before it can be gilt.

When the work is thus ready to receive the gold, the leaves of gold, where the surface is sufficiently large and plain to contain them, may be laid on entire, either by means of the squirrel's tail, or immediately from the paper in which they were originally put; a method that, by those who have the proper dexterity of doing it, is found to be much the simplest and quickest, as well as best for the perfection of the work. Being laid on the proper parts of the work, the leaves must then be settled to the ground, by compressing those which appear to want it gently with

the squirrel's tail or cotton ball; and if any part of the gold has flown off, or been displaced, so as to leave a naked or uncovered spot, a piece of another leaf, of size and figure correspondent to such spot, must be laid upon it. Where the parts are too small to admit of the laying on whole leaves, or where vacancies are left after laying on whole leaves which are less than require others to cover them, the leaves which are to be used must be first turned from the paper upon the cushion, described above amongst the instruments. They must then be cut, by scoring over them, with the knife, (above described likewise) into such divisions or slips as may be most commodiously laid on the parts of the work to be covered; after which, being separated, and taken up as they are wanted, by means of the cotton wool, to which being breathed upon they will adhere, they must be laid in the places they are designed to cover, and gently pressed by the cotton till they touch every where, and lie even on the ground.

Where the work is very hollow, and small pieces are wanted to cover parts that lie deep and out of the reach of the squirrel's tail or the cotton, they may be taken up by the point of a fitch pencil, (being first breathed upon) and by that means conveyed to, and settled in their proper place. Those who are accustomed to it use the pencil commodiously for a great part of the work where large parts of the leaves cannot be used.

The whole of the work being thus covered, should be suffered to remain till it be dry, and it may then be brushed over by a camel's hair pencil, or soft hog's hair brush, to take off from it all loose parts of the gold.

If, after the brushing, any defective parts or vacancies appear in the gilding, such parts must be again sized, and treated in the same manner as the whole was before; but the japanner's gold size alone is much better for this purpose than either the fat oil alone, or any mixture.

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SECT. IV.

*Of Burnish Gilding, with the preparation of the proper
Sizes, &c.*

THE gilding with burnished gold is seldom practised but upon wood, and at present mostly in the case of carved work, or where carved work is mixed with plain. The chief difference in the manner betwixt this and oil gilding lies in the preparing the work to receive the gold, and in the substituting a size made of parchment, or the cuttings of glover's leather in the place of the fat oil, as a cement. The proportion of the size should therefore be previously known, and may be as follows:

" Take a pound of cuttings of parchment, or of the
" leather used by glovers; and, having added to them
" six quarts of water, boil them till the quantity of fluid
" be reduced to two quarts, or till, on the taking out a
" little, it will appear like a jelly on growing cold. Strain
" it through flannel while hot, and it will be then fit for
" use."

This size is employed in burnish gilding, not only in forming the gold size, or cement for binding the gold to the ground, but also in priming, or previously preparing the work. But before I proceed to shew the manner of using it so, it is necessary to give the compositions for the proper cement or gilding size employed in this kind of gilding. There are a multiplicity of recipes for this composition which are approved of by different persons, but as in general they vary not essentially from each other, I will only give two, which I believe to be each best in their kinds.

" Take any quantity of bole ammoniac, and add some
" water to it, that it may soak till it grow soft: levigate
" it then on the stone, but not with more water than will
" prevent its being of a stiff consistence, and add to it a
" little purified suet or tallow scraped, and grind them
" together. When this is wanted for use, dilute it to
" the consistence of cream, by parchment or glover's size
" mixed with double its quantity of water, and made
" warm. Some melt the suet or tallow, and mix it pre-

“ viously with five or six times its weight of chalk before
 “ it is put to the bole, to facilitate their commixture, to
 “ which, in this wet state, they are otherwise somewhat
 “ repugnant. It is also sometimes practised to put soap-
 “ suds to the bole, which will contribute to its uniting
 “ with the tallow.”

This is the simplest composition, and equally good with the following, or any other; but for the indulgence of the variety of opinions, which reigns in all these kinds of matters, I will insert another.

“ Take of bole in fine powder one pound, and of black
 “ lead two ounces: mix them well by grinding, and then
 “ add of olive oil two ounces, and of bees wax one ounce,
 “ melted together, and repeat the grinding till the whole
 “ be thoroughly incorporated. When this mixture is to
 “ be used, dilute it with the parchment or glover’s size,
 “ as was directed in the former recipe. But till the time
 “ of using them; both this and the foregoing should be
 “ kept immersed in water, which will preserve them
 “ good.”

To prepare the wood for burnish gilding, it should first be well rubbed with fish-skin, and then with Dutch rushes; but this can only be practised in the larger and plainer parts of the work, otherwise it may damage the carving, or render it less sharp by wearing off the points. It must then be primed with the glover’s size, mixed with as much whiting as will give it a tolerable body of colour; which mixture must be made by melting the size, and strewing the whiting in a powdered state gradually into it, stirring them well together that they may be thoroughly incorporated. Of this priming seven or eight coats should be given, time being allowed for the drying of each before the other be put on, and care should be taken in doing this to work the priming well with the brush into all the cavities or hollows there may be in the carved work. After the last coat is laid on, and before it be quite dry, a brush pencil dipped in water should be passed over the whole to smooth it and take away any lumps or inequalities that may have been formed, and when it is dry, the parts which admit of it should be again rushed over till they be perfectly even. The work should then be repaired, by freeing all the cavities and hollow parts from the priming, which may choak them or injure the relief of the carving; after

which, a water polish should be given to the parts designed to be burnished, by rubbing them gently with a fine linen rag moistened with water.

The work being thus prepared, when it is to be gilt, dilute the composition of bole, &c. with warm size mixed with two-thirds of water, and with a brush spread it over the whole of the work, and then suffer it to dry, and go over it again with the mixture in the same manner at least once more. After the last coat, rub it in the parts to be burnished with a soft cloth, till it be perfectly even. Some add a little vermilion to the gilding size, and others colour the work, if carved, before it be laid on, with yellow and the glover's size, to which a little vermilion, or red lead, should be added. This last method is to give the appearance of gilding to the deeper and obscure parts of the carving, where the gold cannot, or is not thought necessary to be laid on. But this practise is at present much disused, and instead of it, such parts of the work are coloured after the gilding; which treatment is called *matting*.

The work being thus properly prepared, set it in a position almost perpendicular, but declining a little from you, and having the gilding size, place all the necessary instruments above described ready, as also a basin of clean water ready at hand; wet then the uppermost part of the work, by means of a large camel hair pencil dipped in the water, and then lay on the gold upon the part so wet, in the manner above directed for the gilding in oil, till it be completely covered, or become too dry to take the gold. Proceed afterwards to wet the next part of the work, or the same over again if necessary, and gild it as the first, repeating the same method till the whole be finished. Some wet the work with brandy, or spirit of wine, instead of water; but I do not conceive any advantage can arise from it that may not be equally obtained by a judicious use of water. This manner is moreover much more troublesome and difficult, as well as expensive; for only a small part must be wet at one time, and the gold laid instantly upon it, or the brandy or spirits will fly off, and leave the ground too dry to take the gold.

The work being thus gone over with the gilding, must be then examined, and, such parts as require it, repaired

by wetting them with the camel's hair pencil, and covering them with the gold; but as little as possible of the perfect part of the gilding should be wet, as the gold is very apt to turn black in this state. When the repaired part also is dry, the work may be matted if it require it; that is, the hollow parts must be covered with a colour the nearest in appearance to gold. For this purpose some recommend red lead, with a little vermilion ground up with the white of an egg; but I think yellow ochre, or Dutch pink, with red lead, would better answer the end; or the *terra di Sienna* very slightly burnt or mixed with a little red lead would have a much better effect, and be more durable than any other mixture so near the colour of gold in shade. Isinglass size will likewise equally well supply the place of the whites of eggs in the composition for matting.

The work being thus gilt, it must remain about twenty-four hours, and then the parts of it that are designed to be burnished must be polished with the dog's tooth, or with the burnishers of agate or flint made for this purpose; but it should be previously tried whether it be of the proper temper as to the dryness; for though twenty-four hours be the most general space of time in which it becomes fit, yet the difference of season, or the degree of wet given to the work, makes the drying irregular, with regard to any fixed period. The way of distinguishing the fitness of the work to take the burnish, is to try two or three particular parts at a distance from each other, which, if they take the polish in a kindly manner, the whole may be concluded fit; but if the gold peels off, or be disordered by the rubbing, the work must be deemed not yet dry enough; and if the gold abide well the rubbing, and yet receive the polish slowly, it is a proof of its being too dry, which should be always prevented by watching the proper time; for the work, when too dry, both requires much more labour to burnish it, and fails at last of taking so fine a polish.

SECT. V.

Of Japanner's Gilding.

THE japanner's gilding is performed by means of gold powder, or imitations of it, cemented to the ground by a kind of gold-size much of the nature of drying oil; for the making which, there are various recipes followed by different persons. I shall, however, only give one of the more compound, that is much approved, and another very simple, but which, nevertheless, is equally good for the purpose with the most elaborate. The more compound gold-size may be thus made:

“Take of gum animi and asphaltum each one ounce; of red lead, litharge of gold, and umbre, each one ounce and a half. Reduce the grosser ingredients to a fine powder, and having mixed them, put them, together with a pound of linseed oil, into a proper vessel, and boil them gently, constantly stirring them with a stick or tobacco-pipe, till the whole appear to be incorporated. Continue the boiling, frequently stirring them, till, on taking out a small quantity, it appear thick like tar as it grows cold. Strain the mixture then through flannel, and keep it carefully stopped up in a bottle, having a wide mouth, for use. But when it is wanted, it must be ground with as much vermilion as will give it an opake body, and at the same time diluted with oil of turpentine, so as to render it of a consistence proper for working freely with the pencil.”

The asphaltum does not, I conceive, contribute to the intention of gold-size, and the litharge of gold, and red lead, are both the same thing, with respect to this purpose, under different names, and neither they nor the umbre necessary, but clogging ingredients to the composition.

This gold-size may therefore be equally well, or perhaps better prepared in the following manner:

“Take of linseed oil one pound, and of gum animi four ounces. Set the oil to boil in a proper vessel, and then add the gum animi gradually in powder, stirring each quantity about in the oil, till it appear to be dissolved, and then putting in another, till the whole be

“ commixed with the oil. Let the mixture continue to
 “ boil, till, on taking a small quantity out, it appear of a
 “ thicker consistence than tar, and then strain the whole
 “ through a coarse cloth, and keep it for use; but must,
 “ when applied, be mixed with vermilion and oil of tur-
 “ pentine, in the manner directed for the foregoing.”

This gold-size may be used on metals, wood, or any other ground whatever. But before I enter on the particular manner of gilding with it, the preparation of the true and counterfeit gold powders are necessary to be shewn.

The true gold powder may be well and easily made by the following method :

“ Take any quantity of leaf-gold, and grind it with
 “ virgin honey on a stone, till the texture of the leaves
 “ be perfectly broken, and their parts divided to the minute-
 “ nute degree. Then take the mixture of gold and
 “ honey from off the stone, and put it into a China, or
 “ other such bason, with water, and stir it well about, that
 “ the honey may be melted, and the gold by that means
 “ freed from it. Let the bason afterwards stand at rest
 “ till the gold be subsided; and when it is so, pour off
 “ the water from it, and add fresh quantities till the honey
 “ be entirely washed away, after which the gold may be
 “ put on paper, and dried for use.”

A gold powder of a more intense yellow colour, brighter than this, may be made by a precipitation from gold dissolved in *aqua regia*, by means of either green or Roman vitriol, as has been before observed in p. 162, where directions for the preparation are given.

The German gold powder, which is the kind most generally used, and, where it is well secured with varnish, will equally answer the end in this kind of gilding with the genuine, may be prepared from the sort of leaf-gold, called the *Dutch gold*, exactly in the same manner as the true.

The *aurum Mosaicum*, which is tin coloured, and rendered of a flaky or pulverine texture by a chymical process, so as greatly to resemble gold powder, may be likewise used in this kind of gilding, and prepared in the following manner :

“ Take of tin one pound, of flowers of sulphur seven
 “ ounces, and of *sal Ammoniacus* and purified quicksilver

“each half a pound : Melt the tin, and add the quicksilver to it in that state, and when the mixture is become cold, powder it, and grind it with the *sal Ammoniacus* and sulphur, till the whole be thoroughly commixed. Calcine them in a matraass ; and the other ingredients subliming, the tin will be converted into the *aurum Mosaicum* ; and will be found in the bottom of the glass like a mass of bright flaky gold powder ; but if any black or discoloured parts appear in it, they must be carefully picked or cut out.”

The *sal Ammoniacus* employed, ought to be perfectly white and clean, and care should be taken that the quicksilver be not such as is adulterated with lead, which may be known by putting a small quantity in a crucible into the fire, and observing, when it is taken out, whether it be wholly sublimed away, or have left any lead behind it. The calcination may be best performed in a coated glass body, hung in the naked fire, and the body should be of a long figure, that the other ingredients may rise so as to leave the coloured tin clear of them. The quicksilver, though it be formed into cinnabar along with the sulphur, need not be wasted, but may be revived by distilling it with the addition of quick-lime ; for which a very cheap and commodious method and apparatus may be found in a late treatise on practical chymistry, entitled, *The Elaboratory laid open, &c.*

There are some other coarser powders in imitation of gold, which are formed of precipitations of copper ; but as they are seldom used now for gilding, I shall defer shewing the manner of preparing them till I come to speak of bronzing, where they more properly occur.

Besides these powders, the genuine leaf or Dutch gold may be used with the japanner's gold-size, where a more shining and glossy effect is desired in the gilding. But in that kind of gilding which is intended to be varnished over, or to be mixed with other japan works or paintings in varnish, the powders are most frequently employed.

The gilding with japanner's gold size may be practised on almost any substance whatever, whether wood, metal, leather, or paper ; and there is no further preparation of the work necessary to its being gilt than the having the surface even and perfectly clean.

The manner of using the japaner's size is this: Put then a proper quantity of it, prepared as above directed, and mixed with the due proportion of oil of turpentine and vermilion, into a small gally-pot, or one of those tin vessels above described for containing the colours when used for painting in varnish. Then either spread it with a brush over the work, where the whole surface is to be gilt, or draw with it, by means of a pencil, the proper figure designed, avoiding carefully to let it touch any other parts. Suffer it afterwards, to rest till it be fit to receive the gold, which must be distinguished by the finger in the same manner as with the fat oil, the having a proper clamminess or sticky quality, without being so fluid as to take to the finger, being alike the criterion in both cases. Being found of a proper dryness when the gold powders are to be used, a piece of the soft leather, called *wash-leather*, wrapt round the fore-finger, must be dipped in the powder, and then rubbed very lightly over the sized work; or, what is much better, the powder may be spread by a soft camel's hair pencil. The whole being covered, it must be left to dry, and the loose powder may then be cleared away from the gilded part, and collected by means of a soft camel's hair brush. When leaf-gold is used, the method of sizing must be the same as for the powders; but the point of due dryness is very nice and delicate in these cases, for the leaves must be laid on while the matter is in a due state, otherwise the whole of what is done must be sized and gilt over again.

When more gold-size is mixed up with the oil of turpentine and vermilion than can be used at one time, it may be kept by immersing it under water till it be again wanted; which is, indeed, a general method of preserving all kind of paint, or other such compositions as contain oily substances.

SECT VI.

Of Gilding Paper, and Vellum, or Parchment.

THERE is a variety of methods used for gilding paper, according to the several ends it is designed to answer; but for the most part size, properly so called, and

gum water, are used as the cements; and the powders are more generally employed than the leaf-gold. As I have given the preparation of these several substances before, it is needless to repeat them here; and I shall therefore only point out those circumstances in the manner of their use, which are peculiar to the application of them to this purpose.

OF THE GILDINGS ON PAPER PROPER TO BE USED
ALONG WITH PAINTING IN WATER COLOURS, OR
Fresco.

The gilding proper to be used with water colours may be either used with the leaf-gold, or powder; which last, when mixed with the proper vehicle, is called *shell-gold*.

The leaf-gold is necessary in all cases where a metalline and shining appearance is wanted; and it may be laid on the designed ground by means either of gum water, or isinglass size. The gum water or size should be of the weaker kind, and not laid too freely on the ground, and proper time should likewise be given for it to dry; the judgment on which must be formed, in this case, as in the other kinds of gilding, by touching with the finger. The management of the gold also is much the same in this as in the former; and where a polished appearance is wanting, the dog's tooth, or other kind of burnisher, may be used. In the gilding larger surfaces, it will be found advantageous to colour the ground with the gall-stone; and where colours are to be laid on the gilding, the burnishing the gold over with the gall of any beast will make it take them in a much more kindly manner.

When the gold powders are used along with paintings in water colours, it is previously formed into *shell-gold*, (as it is called from its being usually put into muscle-shells, in the same manner as the colours.) This shell-gold is prepared by tempering the gold powder with very weak gum water, to which a little soap-suds may be put to make the gold work more easily and freely. The preparation of the gold powders is before given, p. 286, and that of the gum water p. 137.

OF THE GILDING PROPER FOR THE COLOURED PAPER FOR BINDING BOOKS, AND OTHER SUCH PURPOSES.

This kind of gilding is performed in much the same manner as that for mixing with paintings in water colours, except with regard to the following particulars: First, in this case, the gilding being intended generally to form some figure or design, the gum water or size, instead of being laid on with a brush or pencil, is most generally conveyed to the ground by means of a wooden plate, or print, and most expediently by an engraved roller, which make an impression of the figure or design intended. Secondly, as the rising of the gold from the surface of the ground is no disadvantage in this kind of gilding, as it is in that mixed with paintings, the gum water or size may be much stronger, which will contribute both to bind the gold firmer, and to give it a sort of embossed appearance that improves the effect. In this kind of gilding the japper's gold size, may be also commodiously employed; for, as the paper must be moistened before it be printed, there is no inconvenience liable to happen from the running of the gold size thus used. Where the embossed appearance is wanted in the greatest degree, the gold size should indeed always be used, and in this case should be thickened with yellow ochre, mixed with as much red lead as the proper working of the print will admit.

The wooden plates or prints used for gilding in this manner, are worked by the hand, and are to be charged with the gum water or size, of whatever kind it be, by letting it gently and evenly down on a cushion on which the gum water or size has been copiously spread by means of a proper brush, and then pressing it on the paper prepared by moistening with water, and laid horizontally with some sheets of other paper under it. Where the rolling print is employed, the gum water or size must be laid on it by a proper brush, immediately out of the pot or vessel which contains it; but too copious an use must be avoided for fear of spreading it beyond the lines of the design or pattern. The subsequent management of the gold, whether leaf or powder, must be the same as in the foregoing kinds of gilding.

It rarely answers to use the leaf-gold in this kind of painting, nor even the true gold powder; but the Ger-

man powder, or that formed of the leaves called *Dutch gold*, is mostly employed, and answers well enough the purpose. The manufacturers of the gilt and marbled papers have not been so much cultivated in our own country as it were to be wished, since very great sums have been always annually paid, both to Germany and Genoa, on this account. The improvement of this manufacture is, therefore, a very fit object of attention to that most laudable society for the establishment and encouragement of useful arts, who have offered premiums to those who would give proofs of their endeavours or success in parallel instances. The society has accordingly given lately a bounty to Mr. Moor, of Newgate-street, who has established a manufacture of gilt and flowered paper, which exceeds greatly the foreign in beauty, and is sold at a cheaper rate than that can be afforded, even when the duty on importation is not paid.

OF GILDING PROPER FOR LETTERS OF GOLD ON PAPER, AND THE EMBELLISHMENT OF MANUSCRIPTS.

The most easy and neat method of forming letters of gold on paper, and for ornaments of writings, is, by the *gold ammoniac*, as it was formerly called; the method of managing which is as follows:

“ Take gum Ammoniacum, and powder it, and then dissolve it in water previously impregnated with a little gum Arabic, and some juice of garlic. The gum Ammoniacum will not dissolve in water so as to form a transparent fluid, but produces a milky appearance; from whence the mixture is called in medicine the *lac Ammoniacum*. With the lac Ammoniacum thus prepared, draw with a pencil, or write with a pen, on paper or vellum, the intended figure or letters of the gilding. Suffer the paper to dry, and then, or any time afterwards, breathe on it till it be moistened, and immediately lay leaves of gold, or parts of leaves cut in the most advantageous manner to save the gold, over the parts drawn or written upon with the lac Ammoniacum, and press them gently to the paper with a ball of cotton or soft leather. When the paper becomes dry, which a short time or gentle heat will soon effect, brush off, with a soft pencil, or rub off by a fine linen

“rag, the redundant gold which covered the parts between the lines of the drawing, or writing; and the finest hair-strokes of the pencil or pen, as well as the the broader, will appear perfectly good.”

It is usual to see in old manuscripts, that are highly ornamented, letters of gold which rise considerably from the surface of the paper, or parchment containing them, in the manner of embossed work, and of these some or less shining, and others have a very high polish. The method of producing these letters is of two kinds; the one by friction on a proper body with a solid piece of gold, the other by leaf-gold. The method of making these letters by means of solid gold is as follows:

“Take crystal and reduce it to powder; temper it then with strong gum water, till it be of the consistence of paste; and with this form the letters. When they are dry, rub them with a piece of gold of good colour, as in the manner of polishing, and the letters will appear as if gilt with burnished gold.”

Kunckle has, in his fifty curious experiments, given this recipe; but omitted to take the least notice of the manner how these letters are to be formed; though the most difficult circumstance in the production of them. It may, however, be done by means of a stamp in this manner: Let the embossed figure, either of the separate letters, or of whole words, be cut in steel; and, when the stamps are to be used, anoint each letter carefully with the end of a large feather dipped in oil; but not so wet as to leave drops in the hollows of the stamps. Fill these concave letters, in the stamps, with the above mixtures of powdered crystal and gum water; and, wiping the other parts of them perfectly clean, place them then on the paper or vellum, laid over some sheets of paper, taking care that the letters may be in the exact position where they ought to lie; strike then the stamp in a perpendicular direction, but not too forcibly, and take it off in the same direction. The letters will be left in their proper places by this means, and will have the same proportions as their archetypes in the stamps.

Where leaf-gold is used for making embossed letters in manuscripts, the above composition cannot be used; but there are several others which will very well supply its

place, of which the following has been given as very excellent :

“ Take the whites of eggs, and beat them to an oily consistence : then take as much vermilion as will be required to thicken the whites of the eggs to the consistence of paste. Form the letters of this paste, by means of the stamps, in the manner before directed, and when they are become dry, moisten them by a small pencil with strong gum-water, observing not to let it run beyond the bounds of the letters. When the gum-water is of a proper dryness, which must be judged of by the rule before given, cover the letters with leaf-gold, and press it close to every part of them, by cotton or soft leather. After the gilding is dry, it may be polished by the dog's tooth, or the other proper burnishers.”

OF GILDING PROPER FOR THE EDGES OF BOOKS AND PAPER.

There are several various methods, with respect to the cement used, by which the edges of books or paper may be gilt, as strong gum-water, or isinglass size, or glover's size may be employed, but as the gum-water and weaker sizes are apt to run beyond the edge, and stick the leaves together, isinglass-melted with the addition of some common proof spirit of wine, and a sixth part of the honey or sugar-candy is greatly preferable ; but a third of bole armoniac well powdered must be added.

The following composition has been likewise approved of for this purpose.

“ Take bole armoniac, and sugar-candy well powdered, each equal parts ; mix them with the whites of eggs beaten to an oily consistence, and the cement will be fit for use.”

In order to the using any of these cements, the paper, whether it be in quires, or books, should be well cut, and polished on the edges to be gilt, and then strongly screwed down by a press ; in which state it is to be brushed over, first with a little of the cement without the sugar-candy, or the bole ; and when that is dry, either with the cement above given, or any other solution of gum or size with the proper proportion of the bole ; after which it may be suffered to dry, and then water-polished, by rubbing it with a fine linen rag slightly moistened. It is then in a state fit

for receiving the gold, only it may be again gently moistened at that time, and the leaves may then be laid on, being cut according to the breadth they are to cover, and pressed closely down by a cotton ball; and after the gilding is thoroughly dry and firm, it may be polished in the manner of the foregoing kinds.

S E C T. VII.

Of Gilding Leather.

LEATHER may be gilded for common occasions by all the same methods which have been given for gilding paper or vellum; except that where the gold size is used there is no occasion to wet the leather, to prevent the running of the oil out of the bounds. Either leaf-gold or the powders may therefore be employed as well for leather as paper; but unless in some fine work, or for very particular purposes, the German gold powder would answer as well as the true gold. It is needless consequently to repeat here the above methods above shewn with respect to the gilding paper for covers to books, &c. which suit equally well for this purpose in general; but as there is a method of gilding leather peculiar to the bookbinders, it is requisite to explain it.

The method of gilding used by the bookbinder, is to have the letters, or compartments, scrolls, or other ornaments, cut in steel stamps; not by sinking, as in most other cases, but by the projection of the figure from the ground. These stamps are made hot, and leaves of gold being laid on the parts accommodated to the pattern or design of the gilding, the hot stamps are pressed strongly on the gold and leather, and bind the gold to it in the hollows formed by the stamp, the other redundant parts of the gold being afterwards brushed or rubbed off.

The manner practised by the professed leather-gilders for the making hangings for rooms, screens, &c. is not properly *gilding* but *laquering*, being done by means of leaf-silver, coloured with a yellow varnish, on the same principle with the lacquered frames of pictures, &c. which were formerly in use. It is an important manufacture, as the leather ornamented in this manner not only admits of great variety of designs in embossed work, resembling ei-

ther gilding or silver, but also of the addition of paintings of almost every sort. The manner of performing this kind of leather gilding is as follows.

The skins are first procured in a dry state after the common dressing and tanning. Those most proper for this purpose are such as are of a firm close texture; on which account, calf or goat skins are preferable to sheep. But in that condition they are too hard and stiff for gilding in this way. In order therefore to soften them, they are first put for some hours in a tub of water, where they are, during such time, to be frequently stirred about with a strong stick. They are then taken out, and, being held by one corner, beaten against a flat stone. They are next made smooth by spreading them on the stone, and rubbing them strongly over by an iron instrument resembling a blade, but with the lower edge formed round, and the upper edge set in a wooden handle, passing horizontally the whole length of the blade. This instrument the workman slides on the surface of the skin as it lies on the stone, at the same time pressing and leaning on it with all his weight. When one of the skins is finished, another is laid over it, and treated in the same manner, and the others over that. The skins being thus prepared, are joined together, to form pieces of the size required for any particular purpose. In order to their joining properly, they are cut into a square, or rather oblong square form. To which end, a ruler or square is used, or the skins are placed on a table or block, corresponding in size and figure to a wooden print of the kind we shall have occasion to speak of below, and as much of the skin is taken off as leaves it of the form and dimensions of the table or block. Any defective parts, or holes in the skin, are then to be made good; which is done by paring away with a penknife, half the thickness of the skin for some little space round the hole, or defective part; putting a patch, or correspondent piece of the same kind of skin over it. This patch, or piece, is to have a margin pared to half the thickness, to suit the pared part of the skin, and is then to be fixed in its place, by means of size made of parchment, or glover's cuttings, in the manner described before, p. 281.

After the skins are thus prepared, the next operation is the sizing them, which is done by means of a kind of soft glue, or stiff size, that answers to the gold size, used in

other kinds of gilding or silvering prepared from parchment or Glover's cuttings. This is, in fact, the same with that directed to be used for joining the pieces, only it must be reduced by longer boiling to a thicker consistence, which should be that of a very stiff jelly.

To size a skin, or piece, the workman takes a piece of the size of the bigness of a nut; which, however, he does not use whole, but cuts into two parts. With one of these parts he rubs all the skin, or piece of leather, strongly; and when it is by this means spread over the whole surface of the leather, he rubs it with the palm of his hand to diffuse it more equally and uniformly over every part. To the effecting this end, the heat of the hand contributes as well as the motion, as it melts the size to a certain degree of fluidity, and renders it consequently more capable of being diffused over the whole surface. The workman then leaves the skin for some time to dry, and afterwards spreads the other part of the size on it, in the same manner as the first, which finishes the operation of sizing. It is necessary to allow some space of time betwixt the laying on the two parts of the size; for if the whole was laid on together, or the first part before the other was dry to a certain degree, the whole would dissolve, and be forced forwards before the hand, instead of being spread by it. In the prosecution of this business, the workman therefore, as soon as he has spread the first part of the size, takes another skin and treats it in the same manner, which filling up the interval of time proper for drying the first, he returns then to that, and puts on the other part of the size, and by this alternative treatment of them employs the whole of his time without any loss, by waiting till either be dry. The side of the skin on which the hair grew, or what is called the *grain* of the leather, is always chosen for receiving the size and silver. This is necessary to be observed, because that side is evenner and of a closer texture than the other.

The skins, being thus sized, are ready for receiving the leaves of silver, which are thus laid on: The workman who silvers them stands before a table, on which he spreads two skins before they are dry after the sizing. On the same table, on the right hand, he puts also a large book of leaf-silver on a board, which, near one end of it, has a

be sufficiently long to raise it in such a manner as to make it slope like a writing-desk.

The book being thus placed, he takes out one by one the leaves of silver, and lays them on the skin previously sized as above. This he does by means of a small pair of pincers, formed by two little rods of wood fastened together at one end, and glued to a small piece of wood, cut into the form of a triangle, intended to keep the ends of the two rods at a distance from each other, and to make them answer the purpose, when pressed by the fingers, of taking hold of the leaves of silver. On the side of the piece on which the rods are joined to form the pincers, there is put a kind of turf, or small brush, of an irregular form, made of foxes, or any other kind of soft hair. With these pincers the workman takes hold of one of the leaves in the book, and puts it on a piece of cartoon, larger than the leaf, of a figure nearly square, and which has the corners of the end, that is to be placed in the hand of the workman, bent. This piece of cartoon is called a *palette*. The workman takes it in his left hand, and having put on it a leaf of silver, he turns it downward, and lets the leaf fall on the skin, spreading it as much as he can, and bringing, as near as possible, the sides of it to be parallel to those of the square of leather, or skin. If it happen that any part of it gets double, or is not duly spread, he sets it right, raises it sometimes, and puts it in its place, or rubs it gently with the kind of brush, or hair pencil, which is at the end of the pincers; but most generally, the workman only lets the leaf fall in its place, spread out on the surface of the leather, without either touching or pressing it, except in the case we shall mention below. After he has done with this leaf, he lays a new one in the same line, and continues the same till such line be complete. He then begins close to the edge of this row of leaves, and forms another in the same manner, and goes on thus till the whole skin be entirely covered with the leaf-silver. This work is very easily and readily performed, as the leaves, which are of a square form, are put on a plain surface, which is also rectangular. The skin being thus covered with the silver, the workman takes a fox's tail, made into the form of a ball at the end, and uses it to settle the leaves by pressing and striking them to make them adhere to the size, and adopt themselves exactly to the places they

are to cover. He afterwards rubs the whole surface gently with the tail, without striking, which is done to take off the loose and redundant parts of the silver, and at the same time to move them to those places of the surface where there was before any defect of the silver; and where, consequently, the size being bare, these will now take. The rest of the loose silver is brushed forwards to the end of the table, where a bag or linen cloth is placed to receive it.

The skins, when they are thus silvered, are hung to dry on cords, fixed by the ends to opposite walls, at such height as to suspend the skins out of the way of the workman. To hang them on these cords, a kind of cross is used, formed of a strong stick, with a shorter piece of the same fixed cross-wise at the end of it, over which the skin being hung without any doubling, and with the silvered side outwards, it is conveyed and transferred to the cord in the same state. The skins are to dry in this condition a longer or shorter time, according to the season and the weather. In summer four or five hours is sufficient, or those skins which have been silvered in the morning may remain till the evening, and those in the evening till next morning; but in winter a longer time is required, according to the state of the weather. There is no occasion, nevertheless, to wait till they be entirely dry, as they may be put in any back yard or garden exposed to the wind, and the heat of the sun. For this purpose they should be put over two boards joined together, where they must be kept stretched out by means of some nails. But in this case the silvered side must be next the boards, in order to prevent any dirt from falling on it, and sticking to the size, which would hinder their taking well the burnish that will be mentioned below. The heat and the dryness of the air must determine also the time of their hanging in this state; but experience alone can teach how to judge of this point. It is proper the skin should be free from moisture, but yet that they should retain all their softness. In summer this will happen in a few hours, and they will be then in a condition to be burnished.

The burnisher which is used for this purpose is a flint, of which various figures may be allowed, and which must be mounted differently with a handle, according to the difference of the figure. A cylindrical form is often cho-

sen, in which case one of the ends should be of a round figure, of about an inch and a half diameter, and have the surface extremely smooth, as the polishing is performed with this surface. The flint is fixed in the middle of a piece of wood of a foot length, the whole of which length is necessary to its serving as a handle, for the workman takes hold of it at each end with each of his hands, those parts being roundish, and the middle being left of a greater thickness, in order to admit of a hole of a proper depth for receiving the flint, so as to keep it quite firm and steady. All the art required in the manner of burnishing is to rub the leaf-silver strongly; for which purpose the workman applies both hands to the burnisher, dwelling longer on those parts which appear most dull. In order to perform this operation, the skin is put and spread even on a smooth stone of a requisite size, placed on a table, where it may be so firm and steady as to bear all the force of pressure the workman can give in sliding the burnisher backwards and forwards over every part of the skin. It would save a great deal of labour to employ, instead of this method of burnishing, that used by the polishers of glass, and also by the card-makers. This method consists in fixing the burnisher at the end of a strong crooked stick, of which the other end is fastened to the ceiling. The stick being so disposed as to act as a spring, of which the force bears on the skin, it exempts the workman from this part of the labour, and leaves him only that of sliding the burnisher along the skin in the directions the polishing requires. The objections to this method are, that some parts of the skin require a greater pressure than others, and that sometimes dirt sticking to the size, which passes thro' the joining of the silver, will scratch the work, if the workman in going along did not see and remove it, which he cannot so well do in using the spring burnisher. But certainly these inconveniences have obvious remedies when they are understood. The using the spring burnisher for the greatest part of the work does not prevent taking the aid of the common one for finishing, if any parts that appear imperfectly polished shall render it necessary, and the workman may well afford the trouble of examining the skin, and cleansing it thoroughly, by the labour he will save in this way; or, perhaps, it is always best to do this

office before any kind of polishing be begun, rather than to leave it to be done during the polishing.

In some manufactures, the burnishing is performed by passing the silvered skins betwixt two cylindrical rollers of steel with polished faces. If this be well executed, it must give a considerable brilliancy to the silver, and take away all those warpings and inequalities in the leather, which tend to render the silvered surface less equal and shining.

The skins or leather being thus silvered and burnished, are now prepared to receive the yellow lacquer or varnish, which gives the appearance of gilding. The perfection of this work depends obviously, in a great degree, on the colour and other qualities of the composition used as such varnish, for which different artists in this way have different recipes, each pretending, in general, that his own is best, and making consequently a secret of it. The following is, however, at least equal to any hitherto used, and may be prepared without any difficulty, except some little nicety in the boiling.

“ Take of fine white resin four pounds and a half, of
“ common resin the same quantity, of gum sandarac two
“ pounds and a half, and of aloes two pounds: Mix them
“ together, after having bruised those which are in great
“ pieces, and put them into an earthen pot over a good
“ fire made of charcoal, or over any other fire where there
“ is no flame. Melt all the ingredients in this manner,
“ stirring them well with a spatula, that they may be tho-
“ roughly mixed together, and be prevented also from
“ sticking to the bottom of the pot. When they are per-
“ fectly melted and mixed, add gradually to them seven
“ pints of linseed oil, and stir the whole well together
“ with the spatula. Make the whole boil, stirring it all
“ the time, to prevent a kind of sediment that will form,
“ from sticking to the bottom of the vessel. When the
“ varnish is almost sufficiently boiled, add gradually half
“ an ounce of litharge, or half an ounce of red lead, and
“ when they are dissolved, pass the varnish through a linen
“ cloth, or flannel bag.”

The time of boiling such a quantity of varnish may be, in general, about seven or eight hours. But as the force of the heat and other circumstances may vary, it does not admit of any precise rule. The means of judging of this is by taking a little quantity out of the pot with a silver

spoon, or other such instrument, and touching it with the finger; when, if the varnish appear, on cooling, of the consistence of a thick syrup, become soon after ropy, and then drying, glue the fingers together, and give a shining appearance, it may be concluded the time of boiling is sufficient. But if these signs are found wanting, the contrary must be inferred, and the boiling must be continued till they do arise. When the quantity of ingredients is diminished, the time of boiling may also be contracted. A pint of oil, and a correspondent proportion of fine resin and aloes, has produced a varnish perfectly good in an hour and a half.

In this process, it is very necessary to have a pot that will not be half filled with all the ingredients, and also to guard with the greatest caution against any flame coming near the top of the pot, or the vapour which rises from it during the boiling; for it is of so combustible a nature, it would immediately take fire, and the ingredients themselves would burn in such a manner as would not only defeat the operation, but occasion the hazard of other inconveniences.

The varnish thus prepared attains a brown appearance; but, when spread on silver, gives it a colour greatly similar to that of gold. If, however, it should not be found after this proceeding that the force of yellow was sufficiently strong, an addition of more aloes must be made before the boiling be discontinued. Care must be taken, nevertheless, in doing this, not to throw in a large lump at once; because such an effervescence is excited, in that case, as would endanger the varnish rising over the edge of the vessel, and producing a flame that would instantly make the whole take fire. On the other hand, if the varnish seem too strong of the colour, sandarac must be added with the same precaution, which, increasing the quantity of varnish, will dilute the colour.

The laying the lacquer, or varnish, on the silvered leather, is performed in the open air, and should be done in summer, when it is hot and dry. It is thus performed: The skins are again to be stretched and fastened with nails to the same boards on which they were before fixed to complete the drying after the silvering; but with this difference, that the silvered side must be outwards. Eighteen or twenty skins may be treated thus at the same time,

there being two or three on each board: All the boards should be then ranged on tressels parallel to each other, in such manner that all, both of them and the skins, may be close to each other. Every thing being thus prepared, the principal workmen spread some of the whites of eggs over each skin. The use of this is to fill up small inequalities in the surface of the skin, and to prevent the varnish passing through the interstices of the silver, and being absorbed by the leather. Some omit this, and with advantage, if these inconveniences could be avoided without it, as it renders the varnish more apt to crack and peel off the silver. But where it is omitted, the varnish should be of a thicker consistence, the surface of the leather of a firm dense texture, and the leaves of silver of a greater thickness than the common. When the white of eggs is dry, the workman, who lays on the varnish, sets it on the table before him on a pot, being, as before directed, pretty near the consistence of a thick syrup. He then dips the four fingers of one of his hands in the varnish, and uses them as a pencil to spread it on the skin. In doing this, he holds the fingers at a small but equal distance from each other, and putting the ends of them on the skin near one of the edges of it, and he then moves his hand so that each finger paints a kind of S with the varnish, from one end of the skin to the other. He afterwards dips his fingers again in the varnish, and repeats the same operation again on the next part of the skin, till the whole be gone over in the same manner. This might be done with a pencil or proper brush, but the workman finds the using the fingers only to be the readiest method for distributing the varnish equally over the skin. After the varnish is thus laid on the skin, it is to be spread, which is still done by the hand solely. The method is to rub the flat of the open hand over every part of the skin on which the varnish has been put by the fingers, and by that means diffuse it evenly over every part. After this, it is to be immediately beaten by strokes of the palms of the hands, which are to be frequently repeated on every part in general, but in a greater degree on those places where the varnish appears to lie thicker than on the rest; and in doing this, both hands are, for despatch, employed at the same time. When this operation is finished, the skins are still to be left on the boards where they were stretched and nailed;

and those boards are therefore, either continued till that time on the tressels where the varnish was put on the skin, or, if they be wanted for fresh skins, taken off, and fixed up against the wall of the place, or any other proper support. The time of drying depends of course on the heat of the sun and weather, but at a seasonable time does not exceed a few hours. It is to be known, as to each particular parcel of skins, by examining them with the finger. If on touching them they be found free from any stickiness, or, in the style of workmen, tickiness; or, that the finger makes no impression on the varnish, they may be concluded sufficiently dry, and the contrary when they are found to be otherwise. This coat of varnish being dry, the skins are to be again put on the tressels as before, and another coat laid on exactly in the same manner as the first. In doing this, examination must be made whether any of the skins appear stronger or weaker coloured than the others, in order that the defect be now remedied, by making this coat thicker or thinner, as may appear necessary. When this coat is dry, the varnish for producing the appearance of gilding is completed; and if it has been well performed, the leather will have a very fine gold colour, with a considerable degree of polish or brightness.

When there is an intention to have one part of the leather silver, and the other gold, a pattern is formed on the surface by printing, calking, or stamping a design on the surface after the silvering. The skin is then to be varnished, as if the whole were intended to be gold; but after the last coat, instead of drying the varnish, it is to be immediately taken off that part which is intended to be silver, according to the design printed or calked upon it, by a knife, with which the workman scrapes off all that he can without injuring the silver, and afterwards by a linen cloth, with which all that remains is endeavoured to be wiped or rubbed off.

The skins, being thus silvered and varnished, are made the ground of various designs for embossed work and painting. The embossed work or relief is raised by means of printing with a rolling-press, such as is used for copper-plates; but the design is here to be engraved on wood. The painting may be of any kind, but oil is principally used, as being durable and most easily performed. There is nothing more necessary in this case than in painting on

other grounds, except that where varnish or water is used, the surface be clean from any oily or greasy matter.

SECT. VIII.

Of Gilding of Glass without Annealing or Burning.

GLASS may be gilt by applying, as a cement, any gold-size, or other size, gum-water, or varnish; and when it is of a proper degree of dryness, laying on the gold, as in the other methods of gilding. The work may also be polished afterwards in the same manner, if the burnished appearance be desired; but where that is intended, it is proper to add bole armoniac, chalk, or other such substance, to the cement.

When drinking-glasses are to be gilt, without burning, the cement should be either some gold-size formed of oil, or some kind of varnish compounded of the gum resins, that will not dissolve in water, but require either spirit of wine or oil of turpentine for their solution. At present, nevertheless, this is not only neglected by those who gild drinking-glasses for sale, but glasses gilded with gum Arabic, or the sizes which will dissolve in water, are imposed upon the public for the German glasses gilt with the annealed gold, and sold at a dear rate under that pretence; though after they have been used for a very short time, the gold peels and rubs off in spots when the glasses are cleaned, and renders them very unsightly. As the glasses with gilt edges are at present much in fashion, and the true kind are brought from Germany, or elsewhere, the incitement of the cultivating this branch of gilding here would not be an unfit object of the premiums of the worthy society for the encouragement of arts; since, for the doing this work in perfection, there is nothing more wanting than that dexterity of the manœuvre which arises from a little practice in matters of this kind, as I have before shewn in treating particularly of this article, p. 155, by a general method, and explained fully there, and elsewhere, the nature of the substances proper to be employed, as far as respects this operation.

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CHAP. II.

Of Silvering.

SILVERING may be practised on the same substances, and by all the same methods, either with leaf or powder, we have before pointed out with regard to gilding; variation being made in a few circumstances below mentioned. It is nevertheless but seldom used, notwithstanding the effect would be very beautiful and proper in many cases; and there is an extreme good reason for such a neglect of it. This reason is its tarnishing in a very short time, and acquiring frequently, besides the general depravity of the whiteness, such spots of various colours as render it very unsightly; and this tarnish and specking is not only the constant result of time, but will be often produced instantly by any extraordinary moisture in the air, or dampness, as well as by the fumes and effluvia of many bodies which may happen to approach it.

Wherever, therefore, silvering is admitted, a strong varnish ought to be put over it; and this even is not sufficient wholly to secure it from this defective consequence. The varnish must be some of the compositions of mastic, sandarac, the gums animi or copal, and white resin; (the particular treatment of which in the forming varnishes will be found in other parts of this work) for the other substances used for compounding varnishes are too yellow. Some put a coat of isinglass size over the silver; but, besides that, the size itself injures the whiteness in time, by turning yellow, it preserves the silver but in a small degree. Experience has shewn, in the case of the silvered leather, what the varnish may be composed of that answers best for this purpose, and the kind before given, p. 300, under that head, may be applied to other purposes.

The methods of making the silver powders are also the same as those of gold, except with regard to one of the German powders, which is correspondent both in its appearance and use, abating the difference of colour, to the *aurum Mosaicum*, or *musivum*; whence it has been indeed, though improperly, called the *argentum musivum*. The

process for this being, therefore, different from any before given, it is proper to insert it fully, as follows :

“ Take of very pure tin one pound : Put it into a crucible, and set it on a fire to melt ; when it begins to run into fusion, add to it an equal proportion of bismuth or tin glass, and stir the mixture with an iron rod, or the small end of a tobacco-pipe, till the whole be entirely melted and incorporated. Take the crucible then from the fire, and after the melted composition is become a little cooler, but while it is yet in a fluid state, pour into it a pound of quicksilver gradually, stirring it in the mean time, that the mercury may be thoroughly conjoined with the other ingredients. When the whole is thus commixed, pour the mass out of the crucible on a stone, where, as it cools, it will take the form of an amalgam, or metalline paste, which will be easily bruised into a flakey powder, and is then fit for use.”

This powder may be either tempered in the manner of the shell-gold, with gum water, or rubbed over a ground properly sized, according to any of the methods above directed for gold powder, and it will take a very good polish from the dog's tooth or burnishers, and holds its colour much better, with a slight coat of varnish over it, than any true silver powder or leaf.

The sizes for silvering ought not to be mixed, as in the case of gold, with yellow, or bole armoniac, but with some white substance, whose effect may prevent any small failures in the covering the ground with the silver from being seen, in the same manner as the yellow substances do the gold. This may be done with flake white, or white lead, when the sizes formed of oil are used ; but whiting is the proper matter in the burnish-size for silvering, or wherever the glover's or parchment size is used. Some recommend tobacco-pipe-clay in the place of whiting, and add a little lamp-black to give a silver-like greyishness to the composition.

Leather is silvered by those who have the manufacture of hangings, screens, &c: though not so frequently with a view to the retaining its own colour as to produce the imitation of gilding, of which the whole process is before given, p. 295. In some cases, nevertheless, the appearance of silver is retained, and it is therefore proper to take some notice of the manner of performing this work. The

proceeding in silvering the leather is to be in all respects the same as when it is to have the appearance of gilding (of which the particular manner has been before shewn under the article of gilding leather) till that part of the process where the varnish or lacquer, which is to give the yellow colour, is to be laid on. Instead of this yellow varnish, a clear colourless one is to be substituted, where the appearance of silver is to be preserved; but this is necessary only in order to prevent the tarnishing and discolouring, which of course happens in a short time to silver exposed in a naked and undefended state to the air. The most common varnish used for this purpose is only parchment size, prepared as above directed, p. 162, which is preferred to others on account of its cheapness. This is made warm in order to render it fluid, and then laid on with a sponge instead of a pencil or brush. There is no reason, however, as this kind of varnish is liable to suffer by moisture, and grow foul and discoloured, that better kinds, such as those of Martin, or others, which are used for *papier mache*, wood, &c. should not be employed here, provided they be colourless. The more hard and transparent, and the more they are of a resinous nature, the more brilliant and white, and the more durable will be the silvery and polished appearance of the silvered leather. Some, instead of parchment size, use that made of isinglass, which may be prepared according to the method laid down p. 169. This resists moisture, and will keep its colour and transparency better than the other kinds of size; but all of them grow yellow and cloudy with time, especially if any damp or moisture have access to them. Indeed silver, secured even by the best varnish, will still in time take a tarnish and lose its beauty, and therefore the giving the leaf-silver on leather the appearance of gold, even tho' attended with some additional expence, is preferable in most cases.

Leather silvered in this manner may be ornamented by printing in relief, and by painting in the same manner as that representing gilding, though, on account of the want of durability, this is much seldomer practised. It is possible that some amalgama of quicksilver, or other composition might be found, that would have the resemblance of silver, and yet resist tarnishing, which would not only be a great improvement, by the furnishing a durable kind of

silvering for leather, paper, &c. but also save part of the expence of leaf-silver for a ground for gilded leather. This has been attempted in France with some success, but not to the degree of perfection wished for.

CHAP. XIII.

Of Bronzing.

BRONZING is clouring by metalline powders, plaister, or other busts and figures, in order to make them appear as if cast of copper or other metals.

This is sometimes done by means of cement, and sometimes without, in the instance of plaister figures; but the bronzing is more durable and secure when a cement is used.

The gold powders, and the *aurum Mosaicum*, we have before given the preparation of, are frequently employed for this purpose; but the proper bronzing ought to be of a deeper and redder colour, more resembling copper, which effect may be produced by grinding a very small quantity of red lead with these powders; or the proper powder of copper may be used, and may be prepared as follows:

“ Take filings of copper, or slips of copper-plates, and
 “ dissolve them in any kind of *aqua fortis* put into a glass
 “ glass receiver, or other proper formed vessel. When
 “ the *aqua fortis* is saturated with the copper, take out the
 “ slips of the plates; or, if filings were used, pour off the
 “ solution from what remains undissolved, and put into it
 “ small bars of iron, which will precipitate the copper
 “ from the *aqua fortis* in a powder of the proper appearance and colour of copper. Pour off the water then
 “ from the powder, and wash it clean from the salts by
 “ several successive quantities of fresh water.”

Where the appearance of brass is designed, the gold powders, or the *aurum Mosaicum* may be mixed with a little of the powder called *argentum musivum*, of which the preparation is above given.

Where the appearance of silver is wanted, the *argentum musivum* is the best and cheapest method, particularly as it will hold its colour much longer than the true silver used either in leaf or powder.

Where no cement is used in bronzing, the powder must be rubbed on the subject intended to be bronzed, by means of a piece of soft leather, or fine linen rag, till the whole surface be coloured.

The former method of using a cement in bronzing, was to mix the powders with strong gum water, or isinglass size; and then with a brush, or pencil, to lay them on the subject. But at present some use the japanner's gold-size, and proceed in all respect in the same manner as in gilding with the powders in other cases; for which ample directions have been before given.

This is the best method hitherto practised. For the japanner's gold-size binds the powders to the ground, without the least hazard of peeling or falling off; which is liable to happen when the gum water, or glover's, or isinglass sizes are used. Though, notwithstanding the authority of the old practice for the contrary, even these cements will much better secure them when they are laid on the ground, and the powders rubbed over them, than when both are mixed together, and the effect, particularly of the *aurum Mosaicum*, will be much better in this way than the other. The gold-size should be suffered, in this case, to approach much nearer to dryness than is proper in the case of gilding with leaf-gold, as the powders would otherwise be rubbed against it in the laying them on.

The factitious silver-powder, called the *argentum musivum*, may, as above-mentioned, be applied in the manner of bronze, by those whose caprice disposes them to silver figures or busts. But it is the only sort of silver-powder that should be used in this way, for the reasons above given; and all such kind of silvering is much better omitted; for the whiteness itself of plaster in figures or busts, and much more a glossy or shining whiteness, is injurious to their right effect, by its eluding the judgment of the eye, with respect to the proper form and proportion of the parts, from the false and pointed reflections of the lights, and the too faint force of the shades. To remove which inconvenience it is probable was the first inducement to bronzing.

CHAP. IV.

Of Japaning.

SECT. I.

Of Japaning in general.

BY japaning is to be here understood the art of covering bodies by grounds of opaque colours in varnish, which may be either afterwards decorated by paintings or gilding, or left in a plain state. This is not at present practised so frequently on chairs, tables, and other furniture of houses, except tea-waiters, as formerly. But the introduction of it for ornamenting coaches, snuff boxes, and screens, in which there is a rivalry betwixt ourselves and the French, renders the cultivation and propagation of this art of great importance to commerce. I shall therefore be more explicit in shewing the methods both now and formerly in use, with the application of each to the several purposes to which they are best adapted, and point out at the same time several very material improvements that are at present enjoyed only by particular persons, or not at all hitherto brought into practise.

The substances which admit of being japanned are almost every kind that are dry and rigid, or not too flexible, as wood, metals, leather, and paper prepared.

Wood and metals do not require any other preparation but to have their surfaces perfectly even and clean. But leather should be securely strained either on frames, or on boards, as its bending or forming folds would otherwise crack and force off the coats of varnish. Paper should also be treated in the same manner, and have a previous strong coat of some kind of size; but it is rarely made the subject of japaning till it is converted into *papier mache*, or wrought, by other means, into such form, that its original state, particularly with respect to flexibility, is lost.

One principal variation in the manner of japaning, is the using or omitting any priming or undercoat on the work to be japaned. In the older practice, such priming was always used, and is at present retained in the French manner of japaning coaches and snuff-boxes of the *papier mache*. But in the Birmingham manufacture here, it has been always rejected. The advantage of using such priming or undercoat is, that it makes a saving in the quantity of varnish used; because the matter of which the priming is composed fills up the inequalities of the body to be varnished, and makes it easy, by means of rubbing and water-polishing, to gain an even surface for the varnish. This was therefore such a convenience in the case of wood, as the giving a hardness and firmness to the ground was also in the case of leather, that it became an established method, and is therefore retained, even in the instance of the *papier mache*, by the French, who applied the received method of japaning to that kind of work on its introduction. There is, nevertheless, this inconvenience always attending the use of any undercoat of size, that the japan coats of varnish and colour will be constantly liable to be cracked and peeled off by any violence, and will not endure near so long as the bodies japaned in the same manner, but without any such priming. This may be easily observed in comparing the wear of the Paris and Birmingham snuff-boxes; which latter, when good of their kind, never peel, or crack, or suffer any damage, unless by great violence, and such a continued rubbing, as wastes away the substance of the varnish; while the japan coats of the Parisian boxes crack and fly off in flakes, whenever any knock or fall, particularly near the edges, exposes them to be injured. But the Birmingham manufactures, who originally practised the japaning only on metals, to which the reason above given for the use of priming did not extend, and who took up this art of themselves as an invention, of course omitted at first the use of any such undercoat; and not finding it more necessary in the instance of *papier mache* than on metals, continue still to reject it; on which account the boxes of their manufacture are, with regard to the wear, greatly better than the French.

The laying on the colour varnish instead of gum water, is also another variation from the method of japaning.

formerly practised. But the much greater strength of the work, where they are laid on in varnish or oil, has occasioned this way to be exploded, with the greatest reason in all regular manufactures. However, they who may practise japanning on cabinets, or other such pieces, as are not exposed to much wear or violence, for their amusement only, and consequently may not find it worth their while to encumber themselves with the preparations necessary for the other methods, may paint with water colour on an undercoat laid on the wood, or other substance, on which the piece to be japanned is formed, and then finish with the proper coats of varnish, according to the method below taught. If the colours are tempered with the strongest singlass size and honey, instead of gum-water and laid on very flat and even; the work will not be much inferior in appearance to that done by the other method, and will last as long as the common old japan work, except the best kinds of the true japan.

It is practised likewise, in imitation of what is sometimes done in the Indian work, to paint with water colours on grounds of gold; in which case the singlass-size with sugar-candy or honey, as above directed, is the best vehicle.

Imitations are also made of japan work, by colouring prints, gluing them to a wood work, and then giving them a shining appearance, by the use of some white varnish.

OF JAPANING GROUNDS.

The proper japan grounds are either such as are formed by the varnish and colour, where the whole is to remain of one simple colour, or by the varnish either coloured or without colour, on which some painting, or other decoration, is afterwards to be laid. It is necessary, however, before I proceed to speak of the particular grounds, to shew the manner of laying on the priming or undercoat where any such is used.

This priming is of the same nature with that called *clear-coating*, or vulgarly *clear-coaling*, practised erroneously by the house-painters; and consists only in laying on and drying in the most even manner, a composition of size and whiting. The common size has been generally used for this purpose; but where the work is of a nicer kind it is better to employ the glower's or the parchment size

and if a third of isinglass be added, it will be still better; and if not laid on too thick, much less liable to peel and crack. The work should be prepared for this priming by being well smoothed with the fish-skin, or glass-shaver; and, being made thoroughly clean, should be brushed over once or twice with hot size, diluted with two-thirds of water, if it be of the common strength. The priming should then be laid on with a brush as even as possible, and should be formed of a size whose consistence is betwixt the common kind and glue, mixed with as much whiting as will give it a sufficient body of colour to hide the surface of whatever it is laid upon, but not more.

If the surface be very even on which the priming is used, two coats of it, laid on in this manner, will be sufficient; but if on trial with a fine rag wet, it will not receive a proper water polish, on account of any inequalities not sufficiently filled up and covered, two or more coats must be given it; and whether a greater or less number be used, the work should be smoothed, after the last coat but one is dry, by rubbing it with the Dutch rushes. When the last coat is dry, the water polish should be given, by passing over every part of it with a fine rag gently moistened, till the whole appear perfectly plain and even. The priming will then be completed, and the work ready to receive the painting, or coloured varnish; the rest of the proceedings being the same in this case as where no priming is used.

OF COMMON GROUNDS OF VARNISH, WHICH ARE TO BE PAINTED UPON.

Where wood or leather is to be japanned and no priming is used, the best preparation is to lay two or three coats of coarse varnish composed in the following manner:

“Take of rectified spirit of wine one pint, and of coarse seed-lac and resin each two ounces. Dissolve the seed-lac and resin in the spirit, and then strain off the varnish.”

This varnish, as well as all others formed of spirit of wine, must be laid on in a warm place; and, if it can be conveniently managed, the piece of work to be varnished should be made warm likewise; and for the same reason, all dampness should be avoided; for either cold or moisture

chill this kind of varnish, and prevent its taking proper hold of the substance on which it is laid.

When the work is so prepared, or by the priming with the composition of size and whiting above described, the proper japan ground must be laid on, which is much the best formed of shell-lac varnish, and the colour desired; if white be not in question, which demands a peculiar treatment, as I shall below explain, or great brightness be not required, when also other means must be pursued. The composition of the shell-lac varnish, with the reasons why it is preferable to all other kinds as a vehicle for colours, I have before given, p. 143, and therefore need not repeat them here; though the advantage of this method over all others, where great brightness is not demanded, and the durability is of consequence, can scarcely be too much urged.

The colours used with the shell-lac varnish, may be any pigments whatever which give the tint of the ground desired, and they may be mixed together to form browns or any compound colours; but, with respect to such as require peculiar methods for the producing them of the first degree of brightness, I shall particularize them below.

The colours for grounds may otherwise be mixed with the white varnishes formed in oil of turpentine, of which the preparation is given, p. 144, 166, 167; but these varnishes have no advantages over the shell-lac, but in their whiteness, that preserves the brightness of the colours, and they are at the same time greatly inferior in hardness to it.

As metals never require to be undercoated with whiting, they may be treated in the same manner as wood or leather when the undercoat is omitted, except in the instances particularly spoken of below.

OF WHITE JAPAN GROUNDS.

The forming a ground perfectly white, and of the first degree of hardness, remains hitherto a desideratum, or matter sought for, in the art of japaning, as there are no substances which can be dissolved so as to form a very hard varnish, but what have too much colour not to deprave the whiteness, when laid on of a due thickness over the work, except some very late discoveries not hitherto brought into practice.

The nearest approach, however, to a perfect white varnish, by means already known to the public, is made by the following composition :

“ Take flake white, or white lead, washed over and ground up with a sixth of its weight of starch, and then dried, and temper it properly for spreading with the mastic varnish prepared as in p. 144, or compound them with the gum animi, according to the directions given in the same page.” Lay these on the body to be japanned, prepared either with or without the undercoat of whitening, in the manner as above ordered, and then varnish it over with five or six coats of the following varnish.

“ Provide any quantity of the best seed-lac, and pick out of it all the clearest and whitest grains, reserving the more coloured and fouler parts for the coarser varnishes such as that above-mentioned for priming or preparing wood or leather. Take of this picked seed-lac two ounces, and of gum animi three ounces, and dissolve them, being previously reduced to a gross powder, in about a quart of spirit of wine, and strain off the clear varnish.”

The seed-lac will yet give a slight tinge to this composition, but cannot be omitted where the varnish is wanted to be hard ; though where a softer will answer the end, the proportion may be diminished, and a little crude turpentine added to the gum animi, to take off the brittleness.

A very good varnish, free entirely from all brittleness, may be formed by dissolving as much gum animi as the oil will take, in old nut or poppy oil, which must be made to boil gently when the gum is put into it. The ground of white colour itself may be laid on in this varnish, and then a coat or two of it may be put over the ground, but it must be well diluted with oil of turpentine when it is used. This, though free from brittleness, is, nevertheless, liable to suffer by being indented or bruised by any slight strokes, and it will not bear any polish, but may be brought to a very smooth surface without, if it be judiciously managed in the laying it on. It is likewise somewhat tedious in drying, and will require some time where several coats are laid on, as the last ought not to contain much oil of turpentine. It must be observed, likewise, that the gum resin, such as the animi, copal, &c. can never be dissolved

in substantial oils by the medium of heat, without a considerable change in the colour of the oils, by the degree of heat necessary to produce the solution. A method of dissolving gum copal in oil of turpentine is, however, now discovered by a gentleman of great abilities in chemistry, and he has also a method of dissolving amber in the same menstruum, so that we may hope soon to see the art of japaning carried to a consummate degree of perfection, when the public are put in possession of these most important inventions, or the fruits of them.

OF BLUE JAPAN GROUND.

Blue japan grounds may be formed of bright Prussian blue, or of verditer glazed over by Prussian blue, or of smalt. The colour may be best mixed with shell-lac varnish, and brought to a polishing state by five or six coats of varnish of seed-lac; but the varnish, nevertheless, will somewhat injure the colour, by giving to a true blue a cast of green, and fouling in some degree a warm blue by the yellow it contains. Where, therefore, a bright blue is required, and a less degree of hardness can be dispensed with, the method before directed, in the case of white grounds, must be pursued.

OF RED JAPAN GROUND.

For a scarlet japan ground vermilion may be used, but the vermilion alone has a glaring effect, that renders it much less beautiful than the crimson produced by glazing it over with carmine or fine lake, or even with rose pink, which has a very good effect used for this purpose. For a very bright crimson, nevertheless, instead of glazing with carmine, the Indian lake, known in the shops by the name of *safflower*, should be used, dissolved in the spirit of which the varnish is compounded (which it readily admits of when good); but in this case, instead of glazing with the shell-lac varnish, the upper or polishing coats need only be used, as they will equally receive and convey the tinge of the Indian lake, which may be actually dissolved by spirit of wine, and this will be found a much cheaper method than the using carmine. If, nevertheless, the highest degree of brightness be required, the white varnishes must be used.

It is at present, however, very difficult to obtain this kind of lake, for it does not appear that more than one considerable quantity was ever brought over and put into the hands of colourmen, and this being now expended, they have not the means of a fresh supply; it, however, may be easily had from the same place whence the former quantity was procured, by any persons who go thither in the East-India Company's ships.

OF YELLOW JAPAN GROUNDS.

For bright yellow grounds, King's yellow, or turpeth mineral, should be employed, either alone or mixed with fine Dutch pink. The effect may be still more heightened by dissolving powdered tumeric root in the spirit of wine, of which the upper or polishing coat is made; which spirit of wine must be strained from off the dregs, before the seed-lac be added to it to form the varnish.

The seed-lac varnish is not equally injurious here, and with greens, as in the case of other colours; because, being only tinged with a reddish yellow, it is little more than an addition to the force of the colours.

Yellow grounds may be likewise formed of the Dutch pink only, which, when good, will not be wanting in brightness, though extremely cheap.

OF GREEN JAPAN GROUNDS.

Green grounds may be produced by mixing King's yellow and bright Prussian blue, or rather turpeth mineral and Prussian blue. A cheap, but fouler kind, may be had from verdigrise, with a little of the above mentioned yellows, or Dutch pink. But where a very bright green is wanted, the crystals of verdigrise (called *distilled verdigrise*), should be employed, and, to heighten the effect, they should be laid on a ground of leaf-gold, which renders the colours extremely brilliant and pleasing.

They may, any of them, be used successfully with good seed-lac varnish, for the reason before given, but will be still brighter with the white varnish.

OF ORANGE-COLOURED JAPAN GROUNDS.

Orange-coloured japan grounds may be formed by mixing vermilion, or red lead with King's yellow, or Dutch pink, or the orange lake, prepared as directed in p. 99,

or red orpiment, will make a brighter orange ground than can be produced by any mixture.

OF PURPLE JAPAN GROUNDS.

Purple japan grounds may be produced by the mixture of lake and Prussian blue, or a fouler kind by vermilion and Prussian blue. They may be treated as the rest with respect to the varnish.

OF BLACK JAPAN GROUNDS TO BE PRODUCED WITHOUT HEAT.

Black grounds may be formed by either ivory-black or lamp-black, but the former is preferable where it is perfectly good.

These may be always laid on with the shell-lac varnish, and have their upper or polishing coats of common seed-lac varnish, as the tinge or foulness of the varnish can be here no injury.

OF COMMON BLACK JAPAN GROUNDS ON IRON OR COPPER, PRODUCED BY MEANS OF HEAT.

For forming the common black japan grounds by means of heat, the piece of work to be japanned must be painted over with drying oil, and when it is of a moderate dryness must be put into a stove of such degree of heat as will change the oil black, without burning it, so as to destroy or weaken its tenacity. The stove should not be too hot when the work is put into it, nor the heat increased too fast, either of which errors would make it blister; but the slower the heat is augmented, and the longer it is continued, provided it be restrained within the due degree, the harder will be the coat of japan. This kind of varnish requires no polish, having received, when properly managed, a sufficient one from the heat.

OF THE FINE TORTOISE-SHELL JAPAN GROUND PRODUCED BY MEANS OF HEAT.

The best kind of tortoise-shell ground produced by heat is not less valuable for its great hardness, and enduring to be made hotter than boiling water without damage, than for its beautiful appearance. It is to be made by means of a varnish prepared in the following manner:

Take of good linseed oil one gallon, and of umbre half a pound. Boil them together till the oil become very brown and thick; strain it then through a coarse cloth, and set it again to boil; in which state it must be continued till it acquire a pitchy consistence, when it will be fit for use."

Having prepared thus the varnish, clean well the iron or copper-plate, or other piece which is to be japanned, and then lay vermilion tempered with shell-lac varnish, or with drying oil diluted with oil of turpentine, very thinly on the places intended to imitate the more transparent parts of the tortoise-shell. When the vermilion is dry, brush over the whole with the black varnish, tempered to a due consistence with oil of turpentine; and when it is set and firm, put the work into a stove, where it may undergo a very strong heat, and must be continued a considerable time, if even three weeks or a month, it will be the better.

This was given among other recipes by Kunckel, but appears to have been neglected till it was revived with great success in the Birmingham manufactures, where it was not only the ground of snuff-boxes, dressing-boxes, and other such lesser pieces, but of those beautiful tea-waiters which have been so justly esteemed and admired in several parts of Europe where they have been sent. This ground may be decorated with painting and gilding in the same manner as any other varnished surface, which had best be done after the ground has been duly hardened by the hot stove; but it is well to give a second annealing with a more gentle heat after it is finished.

SECT. III.

Of Painting Japan Work.

JAPAN work ought properly to be painted with colours in varnish. The methods of this kind of painting I have before given under the article of painting in varnish, in p. 142, and the following. But in order for the greater despatch, and, in some very nice works in small, for the freer use of the pencil, the colours are now most frequently tempered in oil, which should previously have a fourth part of its weight of gum animi dissolved in

it; or, in default of that, of the gums sandarac or mastic, as I have likewise before intimated. When the oil is thus used, it should be well diluted with spirit of turpentine, that the colours may be laid more evenly and thin, by which means fewer of the polishing or upper coats of varnish become necessary.

In some instances, water colours, as I before mentioned, are laid on grounds of gold, in the manner of other paintings, and are best, when so used, in their proper appearance, without any varnish over them, and they are also sometimes so managed as to have the effect of embossed work. The colours employed in this way, for painting, are (as I before intimated) best prepared by means of a singlass size, corrected with honey or sugar-candy. The body of which the embossed work is raised, need not, however, be tinged with the exterior colour, but may be best formed of very strong gum water, thickened to a proper consistence by bole armoniac and whiting in equal parts; which being laid on in the proper figure, and repaired when dry, may be then painted with the proper colours tempered in the singlass size, or in the general manner with shell-lac varnish.

SECT. IV.

Of Varnishing Japan Work.

THE last and finishing part of japanning lies in the laying on and polishing the outer coats of varnish, which are necessary, as well in the pieces that have only one simple ground of colour, as with those that are painted. This is in general best done with common seed-lac varnish, except in the instances, and on those occasions, where I have already shewn other methods to be more expedient; and the same reasons, which decide as to the fitness or impropriety of the varnishes, with respect to the colours of the ground, hold equally well with regard to those of the painting; for where brightness is the most material point, and a tinge of yellow will injure it, seed-lac must give way to the whiter gums; but where hardness, and a greater tenacity, are most essential, it must be adhered to; and where both are so necessary, that is

is proper one should give way to the other, in a certain degree reciprocally, a mixed varnish must be adopted.

This mixed varnish, as I before observed, should be made of the picked seed lac, as directed in p. 315. The common seed-lac varnish, which is the most useful preparation of the kind hitherto invented, may be thus made :

“ Take of seed lac three ounces, and put it into water
 “ to free it from the sticks and filth that frequently are
 “ intermixed with it, and which may be done by stirring
 “ it about, and then pouring off the water and adding
 “ fresh quantities, in order to repeat the operations till
 “ it be free from all impurities, as it very effectually may
 “ be by this means. Dry it then and powder it grossly,
 “ and put it, with a pint of rectified spirit of wine, into
 “ a bottle, of which it will not fill above two-thirds.
 “ Shake the mixture well together, and place the bottle
 “ in a gentle heat, till the seed appear to be dissolved,
 “ the shaking being in the mean time repeated as often as
 “ may be convenient; and then pour off all which can
 “ be obtained clear by that method, and strain the re-
 “ mainder through a coarse cloth. The varnish thus pre-
 “ pared must be kept for use in a bottle well stopped.”

When the spirit of wine is very strong, it will dissolve a greater proportion of the seed lac; but this will saturate the common, which is seldom of a strength sufficient for making varnishes in perfection. As the chilling, which is the most inconvenient accident attending those of this kind, is prevented, or produced more frequently, according to the strength of the spirit, I will take this opportunity of shewing a method by which weaker rectified spirits may with great ease, at any time, be freed from the phlegm, and rendered of the first degree of strength.

“ Take a pint of the common rectified spirit of wine,
 “ and put it into a bottle, of which it will not fill above
 “ three parts. Add to it half an ounce of pearl ashes,
 “ salt of tartar, or any other alkaline salt, heated red
 “ hot, and powdered, as well as it can be, without much
 “ loss of its heat. Shake the mixture frequently for the
 “ space of half an hour; before which time, a great part
 “ of the phlegm will be separated from the spirit, and will
 “ appear, together with the undissolved part of the salts
 “ in the bottom of the bottle. Let the spirit then be
 “ poured off, or freed from the phlegm and salts by means

“ of a *tritorium*, or separating funnel, and let half an ounce
 “ of the pearl ashes, heated and powdered as before, be
 “ added to it, and the same treatment repeated. This
 “ may be done a third time, if the quantity of phlegm,
 “ separated by the addition of the pearl-ashes, appear
 “ considerable. An ounce of alum reduced to powder
 “ and made hot, but not burnt, must then be put into the
 “ spirit, and suffered to remain some hours, the bottle
 “ being frequently shaken; after which, the spirit being
 “ poured off from it, will be fit for use.”

The addition of the alum is necessary to neutralize the remains of the alkaline salt, or pearl-ashes, which would otherwise greatly deprave the spirit with respect to varnishes and lacquers, where vegetable colours are concerned, and must consequently render another distillation necessary.

The manner of using the seed-lac or white varnishes is the same, except with regard to the substance used in polishing; which, where a pure white, or great clearness of other colours is in question, should be itself white; whereas the browner sorts of polishing dust, as being cheaper, and doing their business with greater despatch, may be used in other cases. The pieces of work to be varnished should be placed near a fire, or in a room where there is a stove, and made perfectly dry, and then the varnish may be rubbed over them by the proper brushes made for that purpose; beginning in the middle, and passing the brush to one end, and then, with another stroke from the middle, passing it to the other. But no part should be crossed or twice passed over, in forming one coat, where it can possibly be avoided. When one coat is dry, another must be laid over it, and this must be continued at least five or six times, or more, if, on trial, there be not a sufficient thickness of varnish to bear the polish, without laying bare the painting or the ground colour underneath.

When a sufficient number of coats is thus laid on, the work is fit to be polished, which must be done, in common cases, by rubbing it with a rag dipped in tripoli (commonly called *rotten-stone*) finely powdered. But towards the end of the rubbing, a little oil of any kind should be used along with the powder; and when the work appears sufficiently bright and glossy, it should be well rubbed with

the oil alone, to clean it from the powder, and give it a still brighter lustre.

In the case of white grounds, instead of the tripoli, fine putty, or whiting, must be used; both which should be washed over to prevent the danger of damaging the work from any sand, or other gritty matter that may happen to be commixed with them.

It is a great improvement of all kinds of japan work to harden the varnish by means of heat, which, in every degree where it can be applied short, of what would burn to calcine the matter, tends to give it a more firm and strong texture. Where metals form the body, therefore, a very hot stove may be used, and the pieces of work may be continued in it a considerable time, especially if the heat be gradually increased; but where wood is in question, heat must be sparingly used, as it would otherwise warp or shrink the body so as to injure the general figure.

SECT. V.

Of Gilding Japan Work.

ALL the methods of gilding, which are applicable to the ornamenting japan work, having been before taught under the article of gilding, it is needless to repeat them here. I shall therefore only again observe, that in gilding with gold-size, (which is almost the only method now practised in japan work) where it is desired to have the gold not shine, or approach in the least towards the burnishing state, the size should be used either with oil of turpentine only, or with a very little fat oil; but where a greater lustre and appearance of polish are wanting without the trouble of burnishing, and the preparation necessary for it, fat oil alone, or mixed with a little good size, should be used, and the same proportionable effect will be produced from a mean proportion of them.

C H A P. V.

Of Lacquering.

LACQUERING is the laying either coloured or transparent varnishes on metals, in order to produce the appearance of a different colour in the metal, or to preserve it from rust and the injuries of the weather.

Lacquering is therefore much of the same nature with japanning, both with regard to the principles and practice, except that no opaque colours, but transparent tinges alone, are to be employed.

The occasions on which lacquering is now in general used are three; where brass is to be made to have the appearance of being gilt; where tin is wanted, to have the resemblance of yellow metals; and where brass or copper locks, nails, or other such matters as are to be defended from the corrosion of the air or moisture. There was indeed formerly another very frequent application of lacquering, which was colouring frames of pictures, &c. previously silvered in order to give them the effect of gilding; but this is now greatly disused. These various intentions of lacquering require different compositions for the effectuating each kind, and as there is a multiplicity of ingredients which may be conducive to each purpose, a proportionable number of recipes have been devised and introduced into practice, especially for the lacquering brass work to imitate gilding, which is a considerable object in this kind of art, and has been improved to the greatest degree of perfection. I shall, however, only give one or two recipes for each, as they are all that are necessary, the others being either made too complex by ingredients not essential to the intention, or too costly by the use of such as are expensive, or inferior in goodness, from the improper choice or proportion of the component substances.

The principal body or matter of all good lacquers used at present is seed-lac; but, for coarser uses, resin or turpentine is added, in order to make the lacquer cheaper than if the seed-lac, which is a much dearer article, be used alone. Spirit of wine is also consequently the fluid

or menſtruum of which lacquers are formed, as the etherial oils will not diſſolve the ſeed-lac, and it is proper that the ſpirit ſhould be highly rectified for this purpoſe. As it is ſeldom practicable, nevertheless, to procure ſuch ſpirits from the ſhops, it will be found very advantageous to uſe the method above given for dephlegmating it by alkaline ſalts; but the uſe of the alum, directed in that proceſs, muſt not be forgotten on this occaſion, as the effect of the alkaline ſalt would otherwiſe be the turning the metal of a purpliſh inſtead of a golden colour, by laying on the lacquer.

The following are excellent compositions for braſs work which is to reſemble gilding:

“ Take of turmeric ground, as it may be had at the dry-ſalters, one ounce, and of ſaffron and Spaniſh annatto each two drams. Put them into a proper bottle with a pint of highly-rectified ſpirit of wine, and place them in a moderate heat, if convenient, often ſhaking them for ſeveral days. A very ſtrong yellow tincture will then be obtained, which muſt be ſtrained off from the dregs through a coarſe linen cloth, and then, being put back into the bottle, three ounces of good ſeed-lac, powdered groſſly, muſt be added, and the mixture placed again in a moderate heat, and ſhaken till the ſeed-lac be diſſolved, or at leaſt ſuch part of it as may. The lacquer muſt then be ſtrained as before, and will be fit for uſe, but muſt be kept in a bottle carefully ſtopped.”

Where it is deſired to have the lacquer warmer or redder than this compoſition may prove, the proportion of the annatto muſt be increaſed; and where it is wanted cooler, or nearer a true yellow, it muſt be diminished.

The above, properly managed, is an extreme good lacquer, and of moderate price; but the following, which is cheaper, and may be made where the Spaniſh annatto cannot be procured good, is not greatly inferior to it.

“ Take of turmeric root ground one ounce, of the beſt dragon's blood half a dram. Put them to a pint of ſpirit of wine, and proceed as with the above.”

By diminishing the proportion of the dragon's blood, the varniſh may be rendered of a redder or truer yellow caſt.

Saffron is sometimes used to form the body of colour in this kind of lacquer, instead of the turmeric, but though it makes a warmer yellow, yet the dearth of it, and the advantage which turmeric has in forming a much stronger tinge in spirit of wine, not only than the saffron, but than any other vegetable matter hitherto known, gives it the preference. Though, being a true yellow, and consequently not sufficiently warm to overcome the greenish cast of brass, it requires the addition of some orange-coloured tinge to make a perfect lacquer for this purpose.

Aloes and gamboge are also sometimes used in lacquers for brass; but the aloes is not necessary where turmeric or saffron are used; and the gamboge, though a very strong milky yellow in water, affords only a very weak tinge in spirit of wine.

The varnish for tin may be made as follows:

“Take of turmeric root one ounce, of dragon’s blood two drams, and of spirit of wine one pint. Proceed as in the former.”

This may, like the former, have the red or yellow rendered more prevalent by the increasing or diminishing the proportion of the dragon’s blood. Where a coarser or cheaper kind is wanted, the quantity of seed-lac may be abated, and the deficiency thence arising supplied by the same proportion of resin.

The lacquer for locks, nails, &c. where little or no colour is desired, may either be seed-lac varnish alone, as prepared above, or with a little dragon’s blood, or a compound varnish of equal parts of seed-lac and resin, with or without the dragon’s blood.

The lacquer for picture-frames, where the ground is silver, and the appearance of gilding is to be produced, may be the composition before given, p. 306, for gilding leather, the principle being exactly the same in this case and that.

The manner of laying on the lacquer is as follows:

First let the pieces of work to be lacquered be made thoroughly clean, which, if they be new founded, must be done by means of *aqua fortis*. Being ready, they must be heated by a small charcoal fire in a proper vessel, or any way that may be most convenient; the degree must not be greater than will admit of their being taken hold of without burning the hand. The lacquer must then be laid

on by a proper brush in the manner of other varnishes, and the pieces immediately set again in the same warm situation. After the lacquer is thoroughly dry and firm, the same operation must be renewed again for four or five times, or till the work appear of the colour and brightness intended. For very fine work some use a small proportion of seed-lac, which occasions the lacquer to lie even on the metal; but, in this case, a greater number of coats are required, which multiplies the proportion of labour; tho' where the price of the work will allow for such additional trouble, it will be the more perfect for it.

The lacquering tin may be performed in the same manner as is here directed for brass; but, being for coarser purposes, less nicety is observed, and fewer coats (or perhaps one only) are made to suffice, as the lacquer is compounded very red that the tinge may have the stronger effect.

Locks, nails, &c. where lacquer is only used in a definitive view to keep them from corroding, and not for the improvement of the colour, may be treated in the same manner, but one or two coats are generally thought sufficient; though, where any regard is had to the wear, the coats of lacquer or varnish should always be of a due thickness when they are to be exposed to the air, otherwise the first moist weather makes them chill and look grey and misty, in such manner, that they are rather injurious than beneficial to the work they are laid upon.

The lacquering picture-frames, &c. where the ground is leaf-silver, may be performed in the same manner as before was directed in the case of gilding leather, the circumstances being nearly the same, except with relation to the texture of the subject, to suit which, the different manner of treatment may be easily adapted; but the lacquer as was before observed, may be the same.

C H A P. VI.

Of Staining Wood, Ivory, Bone, Horn, Alabaster, Marble, and other Stones, of various Colours.

S E C T. I.

Of Staining Wood.

OF STAINING WOOD YELLOW.

TAKE any white wood, and brush it over several times with the tincture of turmeric-root, made by putting an ounce of the turmeric, ground to powder, to a pint of spirit, and, after they have stood some days, straining off the tincture. If the yellow colour be desired to have a redder cast, a little dragon's blood must be added, in the proportion that will produce the teint required.

A cheaper, but less strong and bright yellow, may be given to wood, by rubbing it over several times with the tincture of the French berries, prepared as in p. 99, and made boiling hot. After the wood is again dry, it should be brushed over with a weak alum water used cold.

Lesser pieces of wood, instead of being brushed over with them, may be soaked in the decoctions of tinctures.

Wood may be also stained yellow by means of *aqua fortis*, which will sometimes produce a very beautiful yellow colour, but at other times a browner. The wood should be warm when the *aqua fortis* is laid on, and be held to the fire immediately afterwards, and care must be taken, that either the *aqua fortis* be not too strong, or that it be sparingly used, otherwise a brown, sometimes even a blackish colour may be the result.

In order to render any of these stains more beautiful and durable, the wood should be rushed after it is colour-

ed, and then varnished by the seed-lac varnish; or, when desired to be very strong, and to take a high polish, with three or four coats of shell-lac varnish.

OF STAINING WOOD RED.

For a bright red stain for wood, make a strong infusion of Brasil in stale urine, or water impregnated with pearl-ashes, in the proportion of an ounce to a gallon; to a gallon of either of which the proportion of Brasil wood must be a pound, which being put to them, they must stand together two or three days, often stirring the mixture. With this infusion strained, and made boiling hot, brush over the wood to be stained till it appear strongly coloured; then, while yet wet, brush it over with alum water made in the proportion of two ounces of alum to a quart of water.

For a less bright red dissolve an ounce of dragon's blood to a pint of spirit of wine, and brush over the wood with the tincture till the stain appear to be as strong as is desired; but this is, in fact, rather lacquering than staining.

For a pink or rose red, add to a gallon of the above infusion of Brasil wood two additional ounces of the pearl-ashes, and use it as was before directed; but it is necessary, in this case, to brush the wood over often with the alum water. By increasing the proportion of pearl-ashes, the red may be rendered yet paler; but it is proper, when more than this quantity is added, to make the alum water stronger.

These reds, when it is necessary, may be varnished as the yellows.

OF STAINING WOOD BLUE.

Wood may be stained blue by means either of copper or indigo; but the first will afford a brighter colour, and is more generally practicable than the latter, because the indigo can be used only in that state to which it is brought by the manner of preparation used by the dyers, of whom indeed it must be had, as it cannot be properly so prepared but in large quantities, and with a particular apparatus. The method of staining blue with the copper is therefore as follows:

"Take a solution of copper, made according to the directions given in p. 82, and brush it, while hot, several

“ times over the wood; then make a solution of pearl-
 “ ashes, in the proportion of two ounces to a pint of wa-
 “ ter, and brush it hot over the wood; stained with the
 “ solution of copper, till it be of a perfectly blue co-
 “ lour.”

Wood stained green as above by verdigrise, may like-
 wise be made blue, by using the solution of the pearl-ashes
 in the same manner.

When indigo is used for staining wood blue, it must be
 managed thus:

“ Take indigo prepared with soap-lees, as when used
 “ by the dyers, and brush the wood with it boiling hot.
 “ Prepare then a solution of white tartar, or cream of
 “ tartar, which is to be made by boiling three ounces of
 “ the tartar, or cream, in a quart of water; and with this
 “ solution, used copiously, brush over the wood before the
 “ moisture of the tincture of indigo be quite dried out of
 “ it.”

These blues may be rushed and varnished as the reds,
 where there is occasion.

OF STAINING WOOD A MAHOGANY COLOUR.

Mahogany colour is the most useful of any stain for
 wood (especially since the finearing with different colours
 is out of fashion) as it is much practised at present for
 chairs and other furniture made in imitation of mahogany,
 which, when well managed, may be brought to have a
 very near resemblance.

This stain may be of different hues, as the natural wood
 varies greatly, being of all the intermediate tints be-
 twixt the red brown, and purple brown, according to the
 age, or sometimes the original nature of different pieces.

For the light red brown, use a decoction of madder and
 fustic wood ground in water; the proportion may be half
 a pound of madder, and a quarter of a pound of fustic to
 a gallon; or, in default of fustic, an ounce of the yellow
 berries may be used. This must be brushed over the wood
 to be stained, while boiling hot, till the due colour be ob-
 tained, and, if the wood be kindly grained, it will have
 greatly the appearance of new mahogany.

The same effect nearly may be produced by the tinc-
 ture of dragon's blood and turmeric root in spirit of wine
 by increasing or diminishing the proportion of each

which ingredients, the brown stain may be varied to a more red or yellow cast at pleasure. This succeeds better upon wood, which has already some tinge of brown, than upon whiter.

For the dark mahogany take the infusion of madder made as above, except the exchanging the fustic for two ounces of logwood, and when the wood to be planed has been several times washed over, and is again dry, it must be slightly brushed over with water in which pearl-ashes have been dissolved, in the proportion of about a quarter of an ounce to a quart.

Any stains of the intermediate colours may be made by mixing these ingredients, or varying the proportion of them.

Where these stains are used for better kinds of work, the wood should be afterwards varnished with three or four coats of seed-lac varnish; but for coarse work, the varnish of resin and seed-lac may be employed, or they may be only well rubbed over with drying oil.

OF STAINING WOOD GREEN.

Dissolve verdigrise in vinegar, or crystals of verdigrise in water, and, with the hot solution, brush over the wood till it be duly stained.

This may be rushed and varnished as the above.

OF STAINING WOOD PURPLE.

Brush the wood to be stained several times with a strong decoction of logwood and Brasil, made in the proportion of one pound of the logwood, and a quarter of a pound of the Brasil, to a gallon of water, and boiled for an hour or more. When the wood has been brushed over till there be a sufficient body of colour, let it dry, and then be slightly passed over by a solution of one dram of pearl-ashes in a quart of water. This solution must be carefully used, as it will gradually change the colour from a brown red, which it will be originally found to be, to a dark blue purple, and therefore its effect must be restrained to the due point for producing the colour desired.

This may be varnished as the rest.

OF STAINING WOOD BLACK.

Brush the wood several times with the hot decoction of logwood made as above, but without the Brasil; then having prepared an infusion of galls, by putting a quarter of a pound of powdered galls to two quarts of water, and setting them in the sunshine, or any other gentle heat, for three or four days, brush the wood three or four times over with it, and then pass over it again, while yet wet, with a solution of green vitriol in water, in the proportion of two ounces to a quart.

The above is the cheapest method; but a very fine black may be produced by brushing the wood several times over with a solution of copper in *aqua fortis*, and afterwards with the decoction of logwood, which must be repeated till the colour be of sufficient force, and the greenness produced by the solution of the copper, wholly overcome.

These blacks may be varnished as the other colours.

Where the stains are desired to be very strong, as in the case of wood intended to be used for fineering, it is in general necessary they should be soaked, and not brushed, to render which the more practicable, the wood may be previously slit, or sawed, into pieces of a proper thickness for inlaying.

It is to be understood also, that when the wood is above ordered to be brushed several times over with the tinging substances, it should be suffered to dry betwixt each time.

SECT. II.

Of Staining Ivory, Bone, or Horn.

OF STAINING IVORY, BONE, OR HORN, YELLOW.

BOIL them first in a solution of alum, in the proportion of one pound to two quarts of water, and then prepare a tincture of the French berries, by boiling half a pound of the berries, pounded, in a gallon of water with a quarter of a pound of pearl-ashes. After this tincture

has boiled about an hour, put the ivory, &c. previously boiled in the alum water into it, and let them remain there half an hour.

If turmeric-root be used instead of the French berries, a brighter yellow may be obtained, but the ivory, &c. must in that case be again dipped in alum water after it is taken out of the tincture, otherwise an orange colour, not a yellow, will be produced from the effect of the pearl-ashes on the turmeric.

OF STAINING IVORY, BONE, AND HORN, GREEN.

They must be boiled in a solution of verdigrise in vinegar, or of copper in *aqua fortis*, prepared as above directed, (a vessel of glass or earthen-ware being employed for this purpose) till they be of the colour desired.

OF STAINING IVORY, BONE, AND HORN, RED.

Take strong lime water, prepared as for other purposes, and the raspings of Brasil wood, in the proportion of half a pound to a gallon. Let them boil for an hour, and then put in the ivory, &c. prepared by boiling in alum water in the manner above directed for the yellow, and continue it there till it be sufficiently coloured. If it be too crimson, or verge toward the purple, it may be rendered more scarlet, by dipping again in the alum water.

OF STAINING IVORY, BONE, AND HORN, BLUE.

Stain the ivory, &c. first green, according to the manner above directed, and then dip it in a solution of pearl-ashes made strong and boiling hot; but it must not be continued longer, nor dipped oftener, than is necessary to convert the green to blue.

The ivory, &c. may otherwise be boiled in the tincture of indigo prepared as by the dyers, and afterwards in the solution of tartar made as is directed for the staining wood.

OF STAINING IVORY, BONE, AND HORN, PURPLE.

Treat them in the same manner as was directed for red, except that logwood must be substituted in the place of Brasil wood, and the use of the alum water must be omitted wholly.

If a redder purple be wanted, a mixture of the logwood and Brasil must be employed, instead of the logwood alone. The proportion may be equal parts, or any less proportion of the Brasil, according to the colour desired.

OF STAINING HORN IN IMITATION OF TORTOISE-SHELL.

The horn to be stained must be first pressed into proper plates, or scales, or other flat form. The following mixture must then be prepared :

“ Take of quick-lime two parts, and of litharge one, and temper them to the consistence of a soft paste with “ soap-lye.”

Put this paste over all the parts of the horn, except such as are proper to be left transparent, in order to the greater resemblance of the tortoise-shell. The horn must then remain thus covered with the paste till it be thoroughly dry ; when the paste being brushed off, the horn will be found partly opake, and partly transparent, in the manner of tortoise-shell, and when put over a foil, of the kind of latten called assidue, will be scarcely distinguishable from it. It requires some degree of fancy, and judgment, to dispose of the paste in such a manner as to form a variety of transparent parts of different magnitude and figure, to look like the effect of Nature, and it will be an improvement to add semi-transparent parts. This may be done by mixing whiting with some of the paste to weaken its operation in particular places, by which spots of a reddish brown will be produced, that if properly interspersed, especially on the edges of the dark parts, will greatly increase as well the beauty of the work, as its similitude with the real tortoise-shell.

TO STAIN IVORY, BONE, AND HORN, BLACK.

Proceed in the same manner as is above directed, for wood.

SECT. III.

Of Staining Paper, or Parchment, of various Colours.

OF STAINING PAPER, OR PARCHMENT, YELLOW.

PAPER may be stained yellow by the tincture of French berries prepared as in p. 99; but a much more beautiful colour may be obtained by using the tincture of turmeric, formed by infusing an ounce or more of the root, powdered in a pint of spirit of wine. This may be made to give any teint of yellow, from the lightest straw to the full colour, called French yellow, and will be equal in lightness even to the best dyed silks. If yellow be wanted of a warmer or redder cast, annatto, or dragon's blood, must be added to the tincture.

The best manner of using these, and the following tinctures, is to spread them even on the paper, or parchment, by means of a broad brush, in the manner of varnishing.

OF STAINING PAPER, OR PARCHMENT, RED.

Paper, or parchment, may be stained red, by treating in the same manner as is directed for wood, p. 328, or by red ink. It may also be stained of a scarlet hue by the tincture of dragon's blood in spirit of wine; but this will not be bright.

A very fine crimson stain may be given to paper by a tincture of the Indian lake before mentioned, p. 62, which may be made by infusing the lake some days in spirit of wine, and then pouring off the tincture from the dregs.

OF STAINING PAPER, OR PARCHMENT, GREEN.

Paper, or parchment, may be stained green, by the solution of verdigrise in vinegar, or by the crystals of verdigrise dissolved in water, as also by the solution of copper in *aqua fortis*, made by adding filings of copper gradually to the *aqua fortis* till no ebullition ensues; or spirit of salt may be used in the place of the *aqua fortis*.

OF STAINING PAPER, OR PARCHMENT, BLUE.

A blue colour may be given to paper, or parchment, by staining it green by any of the above mentioned me-

thods, and treating it afterwards as is directed for the staining wood blue, by the same means, or by indigo in the manner there explained likewise.

OF STAINING PAPER, OR PARCHMENT, ORANGE.

Stain the paper, or parchment, first of a full yellow, by means of the tincture of turmeric, as above directed; then brush it over with a solution of fixed alkaline salt, made by dissolving half an ounce of pearl-ashes, or salt of tartar in a quart of water, and filtering the solution.

OF STAINING PAPER, OR PARCHMENT, PURPLE.

Paper, or parchment, may be stained purple by archaic or by the tincture of logwood, according to the method above directed for staining wood. The juice of ripe privet berries expressed will likewise give a purple dye to paper or parchment.

SECT. IV.

Of Staining Alabaster, Marbles, and other Stones, of various Colours.

ALABASTER, marble, and other stones, may be stained of a yellow, red, green, blue, purple, black, or any of the compound colours, by the means above given for staining wood. But it is better, when a strong tinge is wanted, to pour the tincture, if made in water, boiling hot on the alabaster, &c. spreading it equally on every part, then to brush it over only, though that may be sufficient where a lighter dye will suffice. When tinctures in spirit of wine are used, they must not be heated, as the spirit would evaporate, and leave the tinging gums in an undissolved state.

When stones are not perfectly white, but partake of brownness or greyness, the colour produced by the tinge will be proportionably wanting in brightness; because the natural colour of the stone is not hid or covered by the tinges, but combines with them; and, for the same reason, if the stone be of any of the pure colours, the result will be a compound of such colour and that of the tinge.



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